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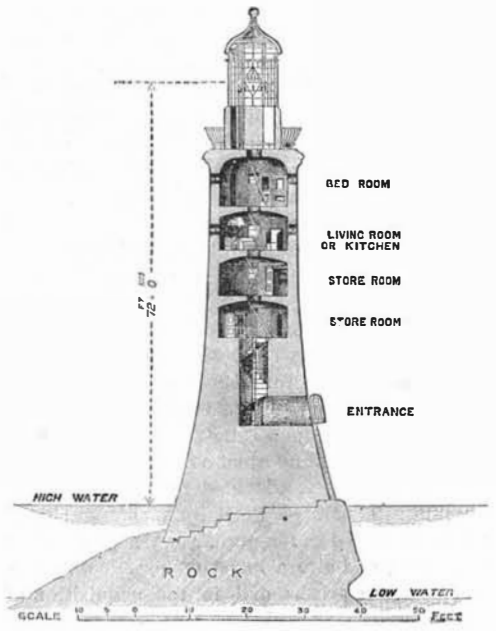
INAUGURATION OF THE NEW EDDYSTONE LIGHTHOUSE.

The first Eddystone Lighthouse was built by Henry Winstanley, in 1696. It was constructed of wood and stone, and was carried away, together with the architect and keepers, by a violent storm in November, 1703. A second, of similar construction, was built in 1708, by John Rudyard, a silk mercer, of London, and this was burnt down in 1755. The famous building by Smeaton succeeded this, and stood for over a century on the famous reef. In 1877 it was discovered that the rocky foundation had been undermined by the waves, and that, although the tower itself was sound, the portion of the reef upon which it rested had become insecure. The construction of a new lighthouse had therefore become imperatively necessary; and its cornerstone was laid by the Duke of Edinburgh, August 19, 1879.



SECTION OF THE OLD TOWER.

The new tower is from designs by Mr. James N. Douglass, chief engineer to the Trinity Board. The building has been entirely carried out under the personal superintendence of Mr. Thomas Edmond, the resident engineer, with Mr. W. T. Douglass as his assistant. It is entirely of granite from the De Lant quarries at Wadebridge, near Padstow, in Cornwall, with the exception of seven courses, in the lower part of the tower, from Aberdeen. A solid cylinder of granite, 44½ ft. in diameter, was first built up from the rock to the height of 2½ ft. above high water. From this, as a base, the tower springs, leaving a terrace, 4½ ft. wide, all round.

Experience and observation satisfied Mr. Douglass that the shape of Smeaton's tower, of which so much had been said, was not the best that could be designed, and that, by allowing the waves to run up readily toward the summit this shape had the effect of throwing the main stress of the water upon the upper part of the tower, where it acted with enormous leverage to weaken the base. He has, therefore, placed the curved portion of the tower upon a base with vertical sides, which will not have the same tendency to produce an upward run of the waves, and has also laid the foundation in a manner somewhat different from that which Smeaton had employed. The tower is built of granite blocks, some of them 6 feet 6 inches deep, 2 feet thick, and 3 feet 10 inches on their outer circumference, and they are all without a flaw. Throughout the whole tower every stone is dovetailed, by projections and grooves, into those above, below, and on either side of it; and the interstices between the blocks have been filled up with Portland cement, which blends the whole into a mass, the joints of which are as hard as the granite itself.

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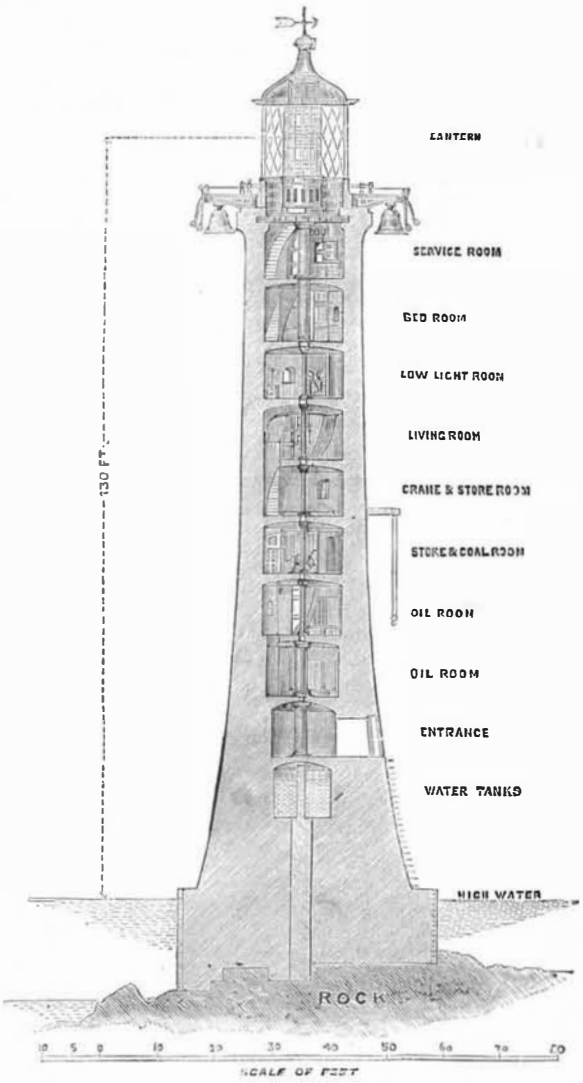

SECTION OF THE NEW TOWER.

INAUGURATION OF THE NEW EDDYSTONE LIGHTHOUSE.

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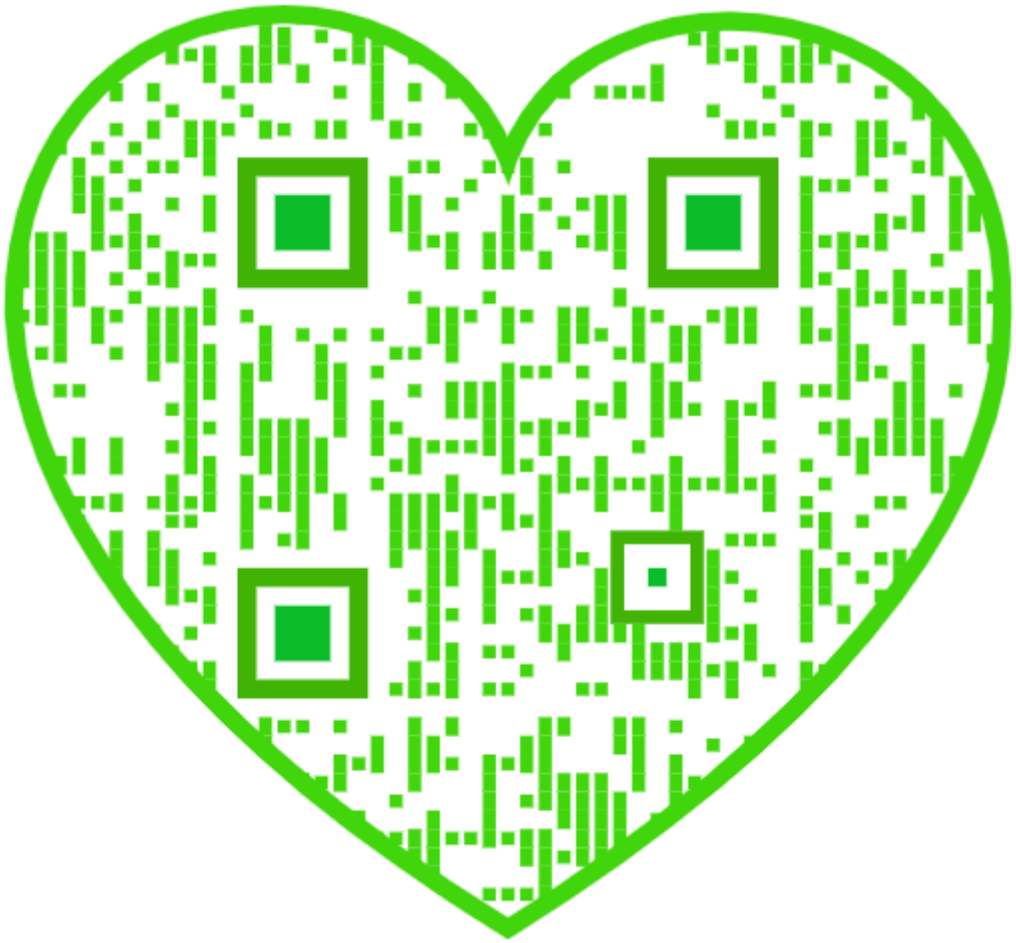

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NEW YORK, SATURDAY, JUNE 24, 1882.

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NON-COMBUSTIBLE FABRICS.

Notwithstanding all that has been written or said about rendering dress goods and curtains non-combustible, the subject does not excite as much public interest as it deserves. We have often referred to the subject, but the following paper by Dr. P. Rabe, in the *Industrie Blaetter*, will prove of interest:

Gay Lussac succeeded in rendering fabrics totally incombustible by soaking them in a 7 per cent solution of sulphate of ammonia. In 1838 the Paris police made the use of uninflammable material compulsory on the stage. This process, however, did not work well, for in course of time the ammonia partially escaped and the sulphuric acid that remained destroyed the fiber. Then, too, the goods gradually lost their non-combustibility by use. Chevalier tried to avoid this by employing a mixture of sulphate of ammonia and borax, but this injured the fabric likewise. After the burning of the Munich Theater Fuchs recommended a coating of waterglass for protecting easily combustible substances. But since the heat causes the waterglass to peel off it affords little protection. Versmann and Oppenheim first made experiments on a large scale, and found that four salts were suitable for impregnating fabrics, viz.: 1. Phosphate of ammonia. 2. Phosphate of ammonia with salammoniac. 3. Sulphate of ammonia. 4. Tungstate of soda. For articles that require starch, only the last is suitable; it has in fact been used in England for twenty years. Abel impregnated fabrics with silicate of lead by first saturating them with sugar of lead, then dipping them in waterglass solution and washing. Subsequently a series of other substances were recommended, the most important of which will be found at the close of this article.

Means have also been discovered for protecting woodwork from burning. Usually it has been attempted to gain this end by means of a paint. Nickle's process, which has been used a good deal in Strassburg, consists in adding to the lime used for whitewashing an equal weight of chloride of calcium solution of 14° B., and applying the whitewash in the usual manner. Another wash used in Westphalia consists of 2½ parts of salammoniac, 1 part of sulphate of zinc, 2 parts of carpenter's glue, 20 parts of zinc white, and 30 parts of water. Patera in Vienna has used with success a mixture of 2 parts of gypsum and one part of sulphate of ammonia in 3 parts of water. J. A. Martin recommends 15 parts of salammoniac, 5 parts of boracic acid, 50 parts of glue, and 1½ parts of gelatine in 100 parts of water, to which is added enough pulverized lime to bring it to the proper consistency.

Schussel and Thouret have rendered wood incombustible by impregnating it with this mixture. To 16 parts of a phosphoric acid solution of 16° B., and 2½ parts of carbonate of ammonia, are added 6 parts of a solution of salammoniac of 10° B., and 1 part of gum arabic. The dried wood is put in this liquid for at least twenty-four hours, then allowed to dry, and painted with oil paint.

There is no doubt that impregnation protects the wood from fire better than any kind of paint, and will no doubt become very important in the future. Probably the rather costly mixture of Schussel and Thouret may be replaced by other substances that are of scarcely any value for other uses, such as the still unused portions of the Stassfurt salts, and the enormous quantity of waste chloride of calcium made in some manufactures. Instead of saturating the wood by simply dipping it into the liquid, it would be better to force it in by atmospheric pressure. In a similar manner wood is already impregnated on a large scale to protect it from decay, and the works where railroad ties are prepared should not permit the preparation of fireproof lumber for building purposes to slip through its hands. The same substances that prevent its burning also protect it from dry rot. It is to be hoped that the use of impregnated fireproof lumber shall not be limited to theaters and similar buildings, but come into general use.

IMPREGNATING LIQUIDS FOR FABRICS.

DISCOVERER	COMPOSITION.
Versmann and Oppenheim.	Solution of tungstate of soda of 28° Twaddle with 3 per cent phosphate of soda.
Nicoll.	6 parts alum, 2 parts borax, 1 part tungstate of soda, 1 part dextrine in soap water.
Siebdrath.	5 parts alum, 5 parts phosphate of ammonia, in 100 parts water.
Patera.	3 parts borax, 2½ parts sulphate magnesia, in 20 parts of water.
Martin.	8 parts sulphate of ammonia, 2¼ parts carbonate of ammonia, 3 parts of boracic acid, 2 parts borax, 2 parts starch, and 100 parts of water.

DEFECTIVE INSTRUCTION IN READING.

The census enumerators found in the common schools, two years ago, close upon ten million pupils. In the high schools there may have been a million more. Let it be granted as no fault of the schools that—as school officers tell us—the lower half of this vast number are too young or have been too little at school to have learned to read more than a hundred or two of the simplest English words. How about the upper half? How many of them know, or are likely ever to know, how to read—that is, to read to good purpose?

As a rough estimate, based upon not a little practical knowledge of the instruction given in our schools and its results, we should say not one-half, including college graduates as well as the graduates of lower schools. In truth, it is the exception when a student learns how to read in school. As a rule, the schools do not teach reading in any strict sense of the term, even when they spend much time in formally drilling their pupils to call off with more or less of elocutionary effect the words of a printed exercise. We have known those who might win prizes for that sort of display, who yet had but the vaguest idea of the essentials of the art of reading. Indeed, their notion of reading is much like that of the young man who protested that he could not see why some people called Euclid "hard reading." He had read a whole book at a sitting, and without the slightest difficulty. That reading implied understanding, had never occurred to him.

The crowning defect of the instruction in reading given in schools could not be more forcibly illustrated. To recognize the words at sight, as words, is the grand object; and when this has been accomplished it is taken for granted that there is no more to be done. The usual matter of the reading exercises makes the delusion easier. At best the selections are purely literary, employing a literary vocabulary, and allowing a wide range of vague comprehension to pass for understanding. When one who has been taught to read in this way (and the majority are) essays, to read matter requiring clearness and precision of thought, or an exact understanding of facts or principles, he is all at sea. He thinks he knows how to read, but he does not. He may be able to call off the words with the utmost readiness; but there is no real reading, for there is no full and clear understanding. The unschooled mechanic, who has ploddingly read for specific information upon subjects he has wanted to master, seeking for knowledge he needed to use, may mispronounce half the words, and yet be the better reader, for he will not be content with empty sounds. To him reading is a means to an end, not an end in itself.

We have sometimes thought that if our common schools should aim first of all and all the time simply to teach pupils to read, the public benefit would be greater than is obtained under the more ambitious system which now prevails. Such teaching would be useful so far as it went, and it would go further for all practical purposes, educational or otherwise, than the delusive smattering of many things which the majority of pupils now get; for it would necessitate a systematic building up of a comprehensive vocabulary every word of which would have to be objectively taught and variously illustrated until its meaning should be as fully comprehended as the pupil's age and capacity might make possible, and also a constant practice in the recognition of known truths and in the acquisition of exact knowledge in and from print.

If all school children were thus taught to read a death blow would be struck to the production of what forms the bulk of the popular literature of the present time, for its market would be spoiled; at the same time the level of popular intelligence would be materially raised, and something like a revolution wrought in social, industrial, and political affairs by exacter habits of popular thinking and speaking. Half the mistakes, misunderstandings, and conflicts which spoil the peace of society arise from the inability of most people to give or follow exact directions, written or spoken. Strictly speaking, the average reader does not know how to read.

LIVE STOCK IN THE UNITED STATES.

A census bulletin gives the statistics of live stock in each of the States and Territories, exclusive of ranche stock and the horses, mules, cows, and swine (in cities or elsewhere), belonging to persons not owning or occupying farms. The totals are: horses, 10,357,981; mules and asses, 1,812,932; working oxen, 993,970; milch cows, 12,443,593; other cattle, 22,488,590; sheep, 35,195,656; swine, 47,683,951. The percentage of increase during the ten years from 1870 to 1880 was: horses, 45; mules and asses, 61; working oxen, (decrease), 25; cows, 39; other cattle, 66; sheep, 24; swine, 90.

The State having the largest number of horses on farms is Illinois, 1,023,082. New York's number is 610,358. If the horses in our cities and employed on the canals were added the showing would be very different. The horses in the other leading States number as follows: Texas, 806,099; Iowa, 792,322; Ohio, 736,478; Missouri, 667,776; Indiana, 581,444; Pennsylvania, 533,578. Missouri leads in mules and asses, with 192,027; Tennessee has 173,488; Texas, 132,581; Georgia, 132,078; Mississippi, 129,778; Illinois, 123,278; Alabama, 121,081; Kentucky, 116,653; Texas has the largest number of working oxen, 90,603; the other States having more than fifty thousand each are: Alabama, 75,534; Mississippi, 61,705; Virginia, 54,769; North Carolina, 50,188; and Georgia, 50,026.

New York leads enormously in milch cows, with 1,437,855; then comes Illinois, 865,913; Iowa, 854,187, Pennsylvania, 854,156; Ohio, 767,043; Missouri, 661,405; Texas, 606,717; no other has half a million, though that number is approached by Indiana, 494,944, and by Wisconsin, 478,374. In "other cattle" Texas leads with 3,387,967, and five other States have over a million each: Iowa, 1,755,343; Illinois, 1,515,063; Missouri, 1,410,507; Ohio, 1,084,917; and Kansas, 1,015,935. Ohio leads in sheep, with 4,902,486; then come California, 4,152,349; Texas, 2,411,887; Michigan, 2,189,389; New Mexico, 2,088,831; Pennsylvania, 1,776,598; New York, 1,715,180; Missouri, 1,411,298; Wisconsin, 1,336,807; and Indiana, Illinois, Kentucky, and Oregon, with over a million each. Iowa leads in swine, with 6,034,316; Illinois has

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5,170,266; Missouri, 4,553,123; Indiana, 3,186,416; Ohio, 3,141,333; Tennessee, 2,158,169; Texas, 1,954,948; Arkansas, 1,565,098; Alabama, 1,252,462; Georgia, 1,471,003; Mississippi, 1,151,818; Nebraska, 1,241,914; Pennsylvania, 1,187,968, Wisconsin, 1,128,825. Michigan and Virginia approach the million, but no others do. There was an increase in the number of working oxen in fifteen States, all southern except Michigan.

The Franklin Institute on "the Legalizing of Theft."

At a special meeting of the Franklin Institute, May 24, the following resolution was adopted:

WHEREAS, By a vote of the House of Representatives of the United States, taken on the 15th day of May, 1882, a bill was passed to amend the United States patent laws—which amendment takes away almost the entire protection granted by letters patent to property acquired by invention, and in effect legalizes theft; and

WHEREAS, It is manifest that any such enactment as will relieve the possessor of a fraudulently made article from all liability as a party to the infringement, will render the protection heretofore guaranteed by letters patent as utterly inadequate as though no patent existed; and

WHEREAS, The unparalleled advances that have been made by this nation in every department of science and industry are due solely and unquestionably to the wise provisions of our patent laws, and all legislation that in any degree detracts from the protection now afforded to inventors would paralyze all the industries which by protected ingenuity have become monuments to American progress, and sources of incalculable wealth to the nation;

Resolved, That it is the sense of the Franklin Institute, of the State of Pennsylvania, for the Promotion of the Mechanic Arts, that the amendment to section 4,919 of the Revised Statutes, relating to the recovery of damages for the infringement of patents, which passed the House of Representatives May 15th, 1882:

Is a violation of the rights insured to the holders of patents under the laws of the United States;

Is a deprivation of the remedies which are essential to the maintenance of those rights;

Is a breach of the contract with patentees made by the laws relating to patents;

Is injurious to the interests of inventors and patentees, with no compensating advantages to any other honest persons;

And is destructive of the system of patents in the United States, which has done more than any other one thing for the promotion of the mechanic arts and the advancement of the material interests of the country.

Prof. Wm. B. Rogers.

Prof. William B. Rogers, one of the founders of the Boston Institute of Technology, and for many years its president, died suddenly, May 30, while addressing the graduating class.

Prof. Rogers was born in Philadelphia, in 1805, and, like his three brothers, early distinguished himself in scientific pursuits. His first lectures on science were delivered in the Maryland Institute in 1827, and two years later he succeeded his father, Dr. P. K. Rogers, as Professor of Natural Philosophy and Chemistry in William and Mary College. In 1835 he accepted the chair of natural philosophy and geology in the University of Virginia, a place which he filled till 1853, when he removed to Boston, where he has since resided. He analyzed the waters of the mineral springs in Virginia in 1835, and organized the State Geological Survey, at the head of which he remained till it was discontinued in 1842. He delivered a course of lectures in 1862, before the Lowell Institute in Boston, on the application of science to the arts, and from 1862 to 1868 was President of the Boston Institute of Technology. He was elected President of the American Association for the Advancement of Science in 1875, and at the time of his death was President of the National Academy of Sciences. As an author he produced a treatise on the "Strength of Materials" (1838); "Elements of Mechanical Philosophy" (1852); and many scientific papers.

John Franklin Gray.

Dr. John F. Gray, the father of homeopathy in America, died in this city, June 5. He was born in Sherbourne, N. Y., in 1804. He was graduated at the College of Physicians and Surgeons in 1826, and shortly after began to practice his profession in this city. Subsequently he adopted homeopathy, and in 1834, in connection with his brother-in-law, Dr. Heill, he started the *Homeopathic Examiner*, the first journal of that school of medicine. The American Institute of Homeopathy was started in 1844 at his suggestion. Hamilton College made him a Doctor of Laws in 1871. He was a believer in a high standard of scholarship. The State Board of Medical Examiners was formed through him; he was its first president, and has since been one of the board.

Progress of Orange Culture in Florida.

A Florida paper says that within a radius of eight miles of Sanford, that State, there are 2,992 orange groves, containing 165,235 trees, and, although only 5 per cent of the trees are now bearing, they produce 2,500,000 oranges annually. The entire State is said to produce 50,000,000 oranges.

Curiosities of Ocean Cables.

Of the total 97,200 miles of cable in the world, some 36,420 are owned and worked by the Eastern Telegraph Company and its affiliated companies, the Eastern Extension Telegraph Company and the South African Telegraph Company. The Eastern Telegraph Company is perhaps the most enterprising of cable corporations, and makes a very fine display at the Crystal Palace, London. Cable operations have been, says *Nature*, of great assistance to the geographer, and the soundings taken in order to ascertain the nature of the sea bottom, where a cable route is projected, have enriched our charts quite as much as special voyages. There is, however, another way in which these operations could be made subservient to the cause of natural science; but it is a way which has not been sufficiently taken advantage of. Besides the specimens of stones, mud, and sand, which the sounding lead brings up from the deep, the cable itself, when hauled up for repairs, after a period of submergence, is frequently swarming with the live inhabitants of the sea floor—crabs, corals, snakes, mollusks, and fifty other species—as well as overgrown with the weeds and mosses of the bottom.

Many an unknown species has passed over the drums unnoted to rot and fester in the general mess within the cable tanks. We venture to predict a rare harvest to the first naturalist who will accompany a repairing ship, and provide himself with means to bottle up the specimens which cling to the cable as it is pulled up from the sea.

Some idea of these trophies may be gathered from the stall of the Eastern Telegraph Company, where a few of them are preserved. Two of these are a very fine gray sea snake, caught on the Saigon cable in a depth of thirty fathoms, and a black and white brindled snake, taken from the Batavian cable in twenty-five fathoms. Twisting round ropes seems to be a habit of this creature, for the writer remembers seeing one scale up a ship's side out in the River Amazon, by the "painter" hanging in the water.

A good example of a feather star is also shown; these animals being frequently found grasping the cable by their tentacles. A handsome specimen of the blanket sponge, picked up in the Bay of Biscay, is also exhibited. But the most interesting object of all is a short piece of cable so beautifully encrusted with shells, serpulæ, and corals, as to be quite invisible. It was picked up and cut out in this condition from one of the Singapore cables. The rapid growth of these corals is surprising, and some valuable information on this head might be gained if the electricians of repairing ships in these eastern waters would only make some simple observations. Curiously enough, so long as the outermost layer of oakum and tar keeps entire, very few shells collect upon the cable, but when the iron wires are laid bare, the incrustation speedily begins, perhaps because a better foothold is afforded.

A deadly enemy to the cable, in the shape of a large boring worm, exists in these Indian seas; and several of them are shown by the company. The worm is flesh colored and slender, of a length from 1½ inches to 2½ inches. The head is provided with two cutting tools, of a curving shape, and it speedily eats its way through the hemp of the sheathing, to the gutta percha of the core, into which it bores an oblong hole.

A full account of this particular worm, with anatomical illustrations, is given in the *Journal of the Royal Microscopical Society* for October, 1881, by Dr. Charles Stewart, Secretary of the Society. The bore holes, after passing through the oakum of the inner sheathing, either pursue a tortuous course along the surface of the gutta-percha core, or go right into the copper wire, thereby causing a "dead earth" fault. Dr. Stewart classes the worm as one of the Eunicidæ, but proposes for it the generic name of *Lithognatha worslei*, because of its possessing a pair of calcareous mandibles or cutting jaws, and after Captain Worsley, the commander of the repairing ship which picked up the worm-eaten cable. The pair of calcareous jaws, in addition to three pairs of chitinous ones, is the most remarkable feature about the animal, and the white plates which form them make the creature look as if it were in the act of swallowing a tiny bivalve shell.

The best protection hitherto formed against it is to cover the core with a ribbon of sheet brass, laid on without a lap. First the gutta percha is covered with cloth, then the brass is overlaid. Canvas is then put over the brass, and the hemp and iron wires over all. A close layer of iron wires is not a sufficient protection, for the worm can sometimes wriggle in between the wires where they are not close enough; and, moreover, the rapid decay of iron wires in tropical seas is certain to leave the core a prey to these pests in a few years.

The Eastern Extension Telegraph Company also exhibit some interesting samples of stones picked up from the sea bottom; for example, limestone blocks and shells bored by the bivalve, *Saxicava ragosa*, the worm Sabella, and the sponge *Hymeniacidon celata*; wood honeycombed by the teredo, a red stone pitted by the bivalve shell (pholas), and a ferruginous flaky stone brought up from the bottom between Penang and Singapore. Most interesting, however, of these inanimate waifs is a flat piece of black flinty rock hollowed into cup-like pits by the sucking feet of the sea hedgehog. The pits are excavated as lairs for the animal, and some of them are nearly three inches in diameter by one inch deep. To make the rocky bed softer to the feel, the hedgehog has lined it with a calcareous enamel, probably secreted by its body, much in the same way as the pearl oyster coats its shell.

In the earlier days of submarine telegraphy, Sir William Thomson declared the life of a cable to be practically inviolable; and Robert Stephenson, on the other hand, was of opinion that no cable would last out ten years. The latter view has proved the more correct, for the average life of a cable hitherto has been about eleven years. Thanks to the improved means of repairing them, however, the outbreak of faults does not mean the loss of a cable, for these flaws can be cut out in water, however deep, and the cable put to rights again. Indeed every cable company expects a recurrence of faults, and provides a fully equipped repairing ship always on the spot.

Cattle Transportation.

A train of ten improved stock cars, containing 158 head of cattle, arrived in this city on the night of May 28. The train left Chicago on the 26th, and ran to Buffalo on slow time. From Buffalo to New York a speed of from 30 to 45 miles an hour was maintained. This is said to be the quickest trip ever made by a live stock train, and the condition of the cattle on their arrival proved the excellence of the treatment they had received on their long journey. The weight of the cattle when loaded in Chicago was 226,098 pounds, an average of 1,430 pounds a head. They arrived in New York at midnight, and early the next morning their aggregate weight was found to be 222,870 pounds, an average of 1,410 pounds each, showing a shrinkage of only 20 pounds a head. The usual shrinkage for this journey is from 70 to 100 pounds. The cattle were watered at stations along the road, and at the same time supplied with hay to be eaten while the train was running.

The improved cars are each 40 feet long, inside measurement, or 10 feet longer than the ordinary cattle car. Each car contains sixteen stalls, eight of which face to one side and eight to the other. These stalls are 2½ feet in width, 8½ feet in length, and 7⅛ feet high, allowing ample room for the largest steer to lie down on and rise from at will his comfortable dried sand bed of an inch and a half's thickness. They are separated by gates, which are cushioned, with spring fastenings, against which the animal can lean without being bruised by the motion of the train. For about one-sixth of the width of the car the gates are permanent, and extend from the floor to the ceiling, but for the remainder of their length fold upward into the rigid section, thus making a free passage for the cattle to pass out of or into the cars. The gates are dropped down, one at a time, as each animal is walked into its stall, while the car is being loaded. The heads of the animals are between the stationary sections, so that "hooking" or quarreling about feed is effectually prevented. In front of the beasts, along the sides of the car, are continuous troughs for feed and water. The food, which may be cut feed or dry hay, is easily introduced from the outside by raising a hinged board that is upheld by a hook while the food is being placed, and afterward dropped and fastened by another hook on the outside to prevent the feed from being thrown out. The water is received through an aperture in the top of the car, and is conveyed directly to the troughs through pipes. The train was provided with automatic brakes.

British Patents in 1881.

During 1881 the British Patent Office received 5,751 applications, the largest number recorded for any year. The number of patents granted is not reported. Of the whole number of applications 2,139, or more than 37 per cent. came from foreigners. The applications from the United States numbered 745, while those from Canada were only 34. France is second on the list, with 552 applications, and Germany third, with 464. From other nations the applications were few: 70 from Austria-Hungary; 70 from Belgium; Sweden 32; Switzerland 40; Russia 24; Italy 19; India 15; Norway 14; Denmark 12. The Australians appear to invent but little or few things likely to find a market in the mother country. The applications from Australia were 8; from New Zealand 5; from Tasmania 1. The South American applications numbered but 10 in all.

The home applications numbered 3,633, the number of applicants being a little more owing to joint inventions. The great majority of the applications came from England, 3,263; the number from Scotland was only 270; from Ireland 63; from Wales 46. In order of inventiveness the ten leading towns stand thus: London (postal district) 1,260; Manchester and Salford 240; Birmingham 220; Glasgow 130; Liverpool 109; Leeds 70; Sheffield 54; Bradford 44; Nottingham 37; Edinburgh 34. For its size the most inventive town is Birmingham.

M. DUMAS, the perpetual President of the French Academy, has been instructed by the Minister of the Interior to make a return of all persons who have been killed or maimed in pursuit of scientific research. It is the desire of the French Government to make some compensation for such casualties, which have hitherto been disregarded. Some time since, says the *Photo. News*, we remember meeting M. Henri Pellet, whose blue-lined copying process is so well known, and sympathizing with him on the loss of the fingers of one hand, which he had sustained through experiments with gun-cotton and nitro-glycerine. "I suppose you will give up explosives, now," was our remark. Our friend laughingly shook his head: "I have my other hand still," he cried, holding it up.

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GENTILLI'S GLOSSOGRAPH.—AN AUTOMATIC SHORT-HAND APPARATUS.

Amadeo Gentilli, C.E., brought before the public a short time ago an invention with which he has been occupied for a number of years. The purpose of this apparatus is to record speech automatically, in easily deciphered characters, with the rapidity of the normal flow of speech. The inventor did not proceed with his studies, as the inventors of the telephone and phonograph, upon the principle of acoustics, because he could not succeed in making practical use of the microscopical characters thus obtained; but he converts the motions of articulation of the organs of speech into visible permanent characters.

An easily managed instrument, shown in Fig. 1, is provided with delicate levers which rest upon the different parts of the tongue and lips, and slender wings swing before the nostrils. The levers of this instrument may be taken in the mouth without any inconvenience.

On speaking these levers and the wings move, and their motions are transferred partly in a mechanical way and partly by electricity to a writing pencil, which marks the single sound with great precision upon six lines parallel and near to each other on a strip of paper, which is moved forward by hand or clockwork. Upon the utterance of the vowels and consonants, moving one or more parts of the organs of speech more or less strongly, or upon the air being exhaled through the nose, the signs corresponding to the sounds uttered are recorded and may be read at once. For example, in uttering ch, r, g, the back part of the tongue is raised; with s, h, l, the tip of the tongue; and with e, i, the whole tongue is moved; with s, t, the tongue is pushed forward against the teeth; with o, u, the under lip, and with f, b, the upper lip is moved; and with n, m, the soft palate is depressed in such a manner that the air which otherwise would issue from the mouth finds its way through the nose. These characteristic motions through double levers are transferred in the instrument from the inside to the outside of the mouth in such a way that with the utterance of ch, r, g, lever IV.; with e, i, levers IV. and V.; with s, ch, l, lever, VI.; with s, t, levers V. and VI; with a, o, u, lever III.; with f, b, levers II. and III. are put in motion and produce larger or smaller variations of the pencil from its position of rest. The nasal sounds, n and m, place lever I. in motion.

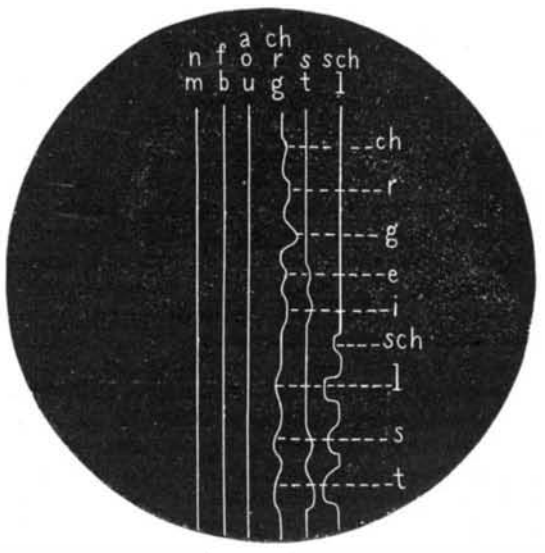
These few signs suffice for the interpretation of language, for in our conventional orthography, taking into consideration only the phonetic sound marks, it will be found that b, d, and g are only less degrees of intensity of sound than p, k, and t; that c, z, q, and x are composed from ts, kw, and ks; that between f and v no difference exists; and that w is only a sonorous modification of v. The system of writing of this apparatus, as represented in Figs 3 and 4, may be quickly learned. There are certain rules which make the deciphering easier. These rules rest upon the laws of the construction of syllables and the combination of consonants.

The German and Italian languages are best adapted for recording by this apparatus, because in these languages the phonetic mode of writing varies least from the orthography, but this does not prevent its being applied to other languages.

Stenography through the use of this apparatus (which the inventor calls a glossograph) becomes, in a certain measure, the public property of every one who will undertake the easy and interesting labor of learning the key of this "nature's self-writing." This apparatus may be used for the recording of public speeches, not by the orator himself, but by one employed for that purpose, who takes the instrument in his mouth and repeats the speech softly, for the voice plays no part in bringing out the signs.

The glossograph has the advantge over stenography as it is practiced now, as it requires no previous study or practice, it demands no straining of the attention, and consequently causes no weariness. Only the deciphering requires practice. The employment of an apparatus which will enable us to write four or five times as rapidly as formerly, especially in an age when so much writing is done as in ours, will not be confined to the noting down of public speeches, and if the compass of the practical value of this invention has only been glanced at it must be perceived that there is a fruitful principle in it which is capable of great development. Herr Gentilli a short time ago gave an exhibition of his invention before the Institute of Physical Chemistry of the University of Leipsic, and gave proofs of the practical utility of the apparatus.

A few imperfections which appeared at the first exhibition of the apparatus have since been obviated by the inventor. He has separated the speaking apparatus from the writing apparatus, and provided the latter with clockwork, so that the writing is more distinct, and by the relative duration of



RECORD OF THE GLOSSOGRAPH.

the single signs a valuable knowledge of the signs may be obtained. The transmission of the motions is made by electricity: the contact of the tongue with the soft palate, or the lips with each other, is imprinted by the closing of the working current.—*Illustrirte Zeitung.*

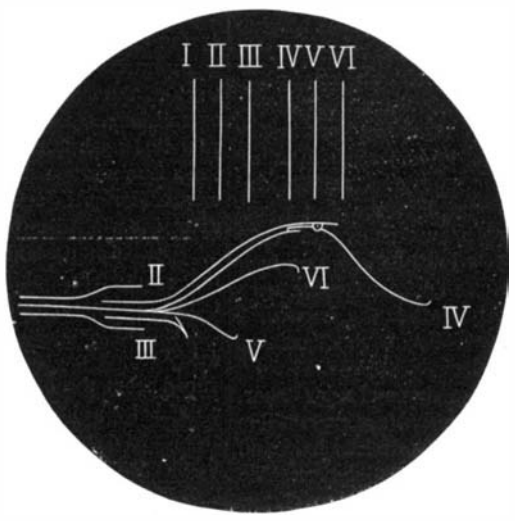
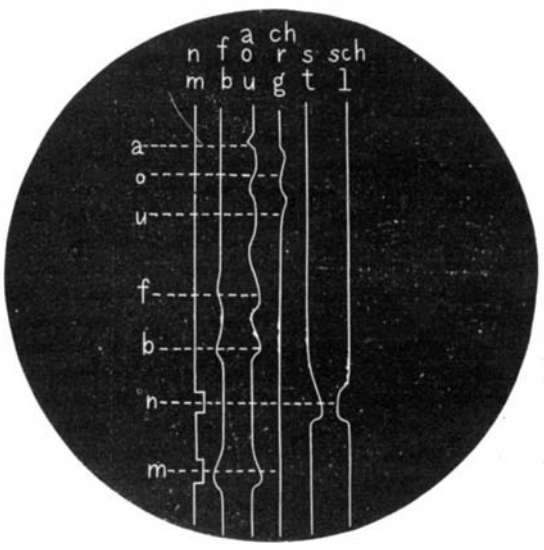


DIAGRAM OF THE LEVERS.



RECORD OF THE GLOSSOGRAPH.

Potash as an Antidote to Snake Poison.

The Brazilian Government has distributed throughout the empire a circular announcing the fact that Dr. J. B. de Lacerda, of Rio Janeiro, has found an antidote to snake poison in permanganate of potash, and explaining the manner of its use. Dr. Lacerda recommends that the permanganate be injected into the wound made by the fangs of the snake, and also into the surrounding tissue in different parts of the member bitten, when the application is delayed. In this way life has been saved eight or ten hours after the bite was received.

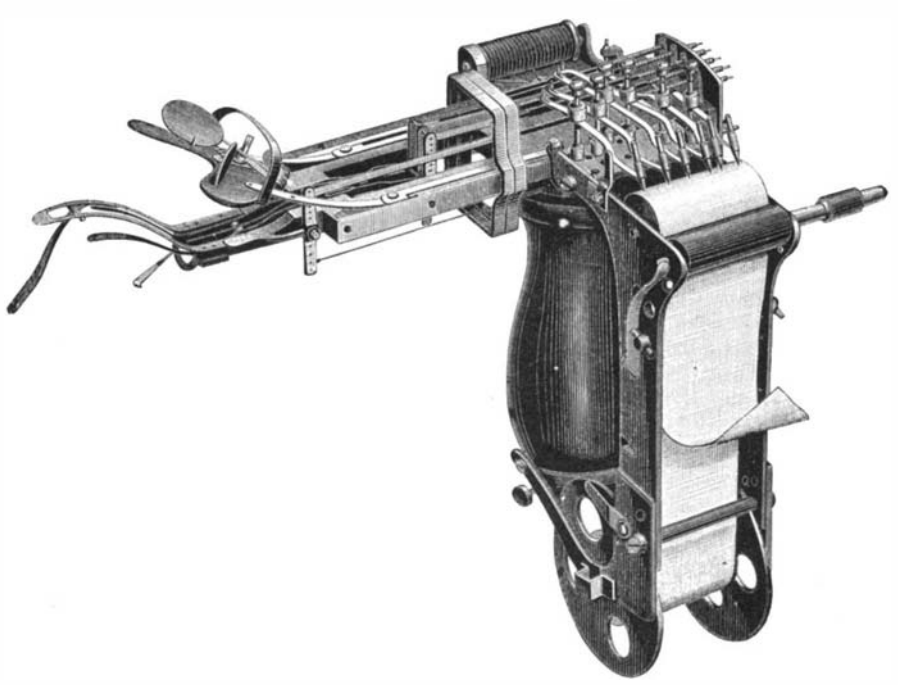
In a recent letter to the London *Lancet,* Dr. Lacerda says that his experiments were made with the venom of the following species: Surucucú (Lachesis rhombeata), a reptile that attains a large size (two meters and more), and whose bite is considered to be one of the most dangerous; jararaca (Bothrops jararaca), the most common of our venomous species, and whose dimensions seldom exceed one meter; jararacussú (Bothrops jararacussú), whose bite is as much feared as that of the surucucú, and which attains a larger size than the jararaca; and finally the urutú, a species not very well defined as yet zoologically, but which is similar to the bothrops, and is endowed with a very active poison. He has already collected about forty cases of bites in man, of individuals belonging to these different species, in which hypodermic injections of permanganate of potash have given the best results. Among these there are even two cases of bites by the rattlesnake (Crotalus horridus).

Tests applied in India show that the same treatment is efficacious against the poison of the cobra de capello. It is noteworthy that the permanganate of potash, as used by Dr. Lacerda, in a solution of 1 in 100, has no irritating effect.

Dr. John Shortt, formerly Deputy Surgeon General of the Madras Army, in a communication to the *Lancet,* says that as long ago as 1869–70 he publicly demonstrated the efficiency of liquor potassæ as a cure for snake bite, and describes a number of cases of successful treatment of snake bites with this remedy. In summing up Dr. Shortt says: "In the course of a large series of experiments with snake poison, I discovered that the liquor potassæ neutralized the poison completely and rendered it inert. Having thus satisfied myself of this fact, and after further experiments, I found that potash combined with brandy as a diffusible stimulant roused the nervous system, excited the circulation, and thus carried the potash into it as rapidly as possible, and enabled it to overtake and neutralize the poison in the blood. Being satisfied on this point, when the snake bitten cases came for treatment, I, in the most careful manner, put into practice the plan I had found so successful in my experiments on these patients with perfect success. Of the five cases thus treated two were the bites of cobras, two that of Russell's viper, and the other one that of a green viper. It is difficult to get a succession of cases of snake bite for treatment, but the secret of success by this method consists in bringing the patient's system rapidly under the influence of the potash and brandy, or, in other words, to make the patient drunk as speedily as possible, and maintain this effect for some time after, till the system becomes thoroughly saturated with the potash, and the whole of the secretions become alkaline. I have tested the permanganate of potash also, and have found that it likewise renders snake poison inert, but as it is the potash alone that possesses the power of neutralizing snake poison, I do not see the advantage of using the compound known as the permanganate of potash."

In Dr. Shortt's treatment the wound was scarified, so as to bleed freely, and then kept wet with a lotion composed of three ounces of liquor potassæ and ten ounces of warm water. Meantime the patient was given hourly doses of one and a half ounces of a mixture of three drachms of liquor potassæ, nine ounces of brandy, and four and a half ounces of water.

Where obtainable the hypodermic injection of permanganate of potash as prescribed by Dr. Lacerda would seem to be the quicker way to neutralize the poison and one less likely to cause a general disturbance of the patient's system.



GENTILLI'S GLOSSOGRAPH.

New York as a Manufacturing Center.

New York city is popularly regarded as a great commercial center whose prosperity is based entirely upon its foreign trade. It is true that it is the commercial metropolis of the continent; it is also true, but less generally known, that New York is the greatest manufacturing center in the world. The products of the factories of the city proper turn out products worth nearly $450,000,000 a year, while those of its chief suburbs swell the total to something near $750,000,000. This vast sum is within a hundred million dollars of the entire foreign commerce of the port. If the manufacturing progress continues at its present rate a very few years will see the value of manufactured products equal or exceed the city's import and export trade.

CEMENT FOR REPAIRING GLASS.—Dissolve fine glue in strong acetic acid to form a thin paste.

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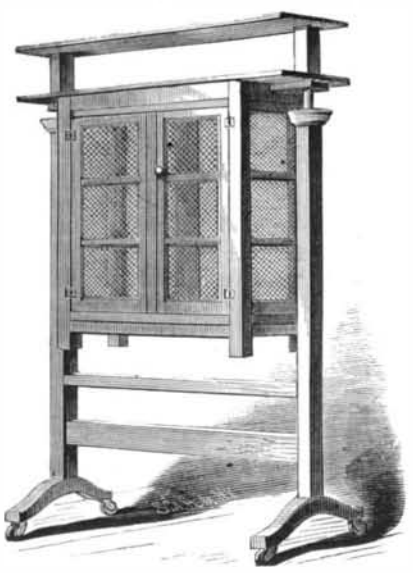
NEW SUSPENDED SAFE.

The engraving shows an improved suspended provision safe, arranged for preventing crawling insects from obtaining access to the interior. The safe itself is of the usual construction, with its sides and the hinged door covered with wire gauze or perforated sheet metal for insuring the proper ventilation, and preventing flying insects from getting inside. The top of the safe projects beyond its sides, so as to admit of the suspension of the safe. Two upright posts, having feet at their lower end, are connected together by a cross brace.

To the upper ends of these posts are connected cups for holding liquid, to prevent the crawling insects from ascending the posts above the cups. The cups are held in place on the ends of the posts by screw rods, which pass through holes in the cups, and are screwed into the ends of the



MASON'S SUSPENDED PROVISION SAFE.

posts. To prevent the liquid in the cups from escaping through the holes in the bottom, a packing ring is placed on the bottom of the cups, and above the packing ring a metal washer, the rod passing through the packing ring and washer; it also passes the projecting ends of the top of the safe. By this means the safe is securely held in a suspended position, and between the projecting ends of the top and cups around the rod there is a sleeve for keeping the packing rings tightly pressed down against the bottom of the cups, sealing the joint between the rods and cups, and preventing the possibility of the liquid escaping. The metal washers in the cups, as will be seen, form bearing plates for the lower ends of the sleeves to rest against, so that by tightening the rods, the sleeves will be forced down more tightly against the metal washers and compress the packing between the washers and bottom of the cups.

It will be seen that the safe is wholly suspended from contact with any object except the rods, thus insuring a great protection of the contents of the safe from crawling insects. This useful invention has been patented by Mr. Sanford Mason, of Galveston, Texas.

Launching a Ship by Means of Electricity.

In launching the English turret ship Colossus, March 21, electricity was employed by means of an ingenious contrivance which connected the dog shores with a large magnet; and in a similar manner the christening was performed. Simultaneously with the breaking of the bottle over the ship's nose a musical instrument inside an ornamented box was set at work, and "Rule Britannia" was the result. By this time the course was reported clear, and, as the ship gave evidence of anxiety to leave the cradle, it was deemed advisable, though ten minutes before time, to let her go. The pressure of the launching button was followed by a heavy thud. The weight had fallen and the dog shores had been knocked away. The ship moved instantly, and the huge mass of 4,420 tons —the heaviest ever launched from the Portsmouth yard—glided gracefully down the inclined plane into the harbor, amid the music of the bands and the enthusiastic cheers of the multitude.

THE Marlin (Texas) *Index* reports a newly discovered food for horses in Falls county, that State. In the Brazos bottom grows a weed, in height 15 or 20 feet, that is said to be almost as nutritious as corn. It is called the "blood weed," from the fact that when broken there escapes a juice that is almost as red as blood. Many farmers feed their work stock but once a day with corn. The other two meals are made by "staking" on blood-weed. In many instances the work stock are exclusively fed on this weed.

Primitive Pounding Mills in Arkansas.

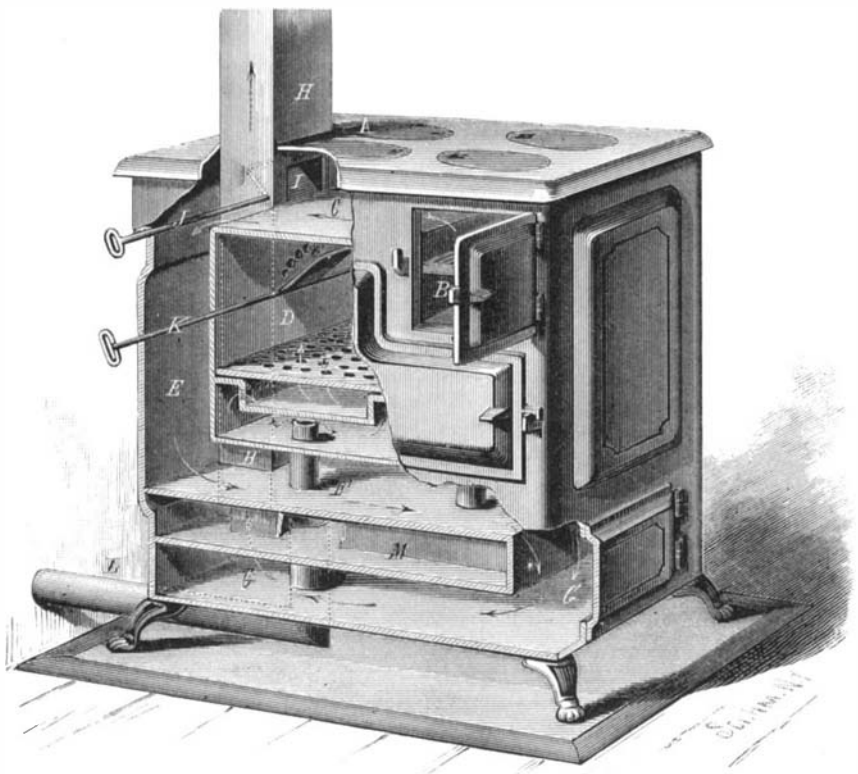
A letter from the Rev. John Buchanan, quoted in an interesting address recently delivered before the Arkansas Historical Society by the Hon. Benjamin T. Duval, thus described the expedients of the first settlers in what is now Washington county, Ark.: "For more than two years these early settlers enjoyed the privilege of eating pound cake, having no mills to grind grain of any kind. They had to make their meal by pounding. Some families having springs suitable, fixed pounding mills and beat their meal by water power. The mill was made by getting a large log of timber about 15 feet long, making a trough at the butt-end 3 feet long, to hold as much water as possible, hewing the balance of the log some 4 inches square, hanging it on a pivot near the trough. They fixed a pestle at the other end, and then a mortar to hold the grain. The trough was about 4 feet above the ground. A spout carried water from the spring into it, and when the trough was full it sank down, raising the pestle some 10 feet high. When the water poured out the pestle fell with a vim on the grain in the mortar. It was slow but sure, running day and night. They were called Lazy Toms. They were inclosed with palings to keep out fowls and vermin (wild animals). The first mill for grinding grain was built in 1829 by Peter Pyeatt, on the creek heading at Mark Bean's spring. The second was built a short time after by Sam Billingsly, at or near where Kidd's mill stood before the war. John F. Truesdale put up a steam mill at the same place about the year 1840."

IMPROVEMENT IN COOKING STOVES AND RANGES.

The engraving shows an improvement in cooking stoves and ranges recently patented by M. A. Nicholson, of Richwood, Union county, O. The principal object sought in the invention is to increase the efficiency of the ovens. The range, A, has a firebox, B, from which the products of combustion pass through the space under the top and above the oven, D, to the side flues, E, chamber, F, below the oven. At the forward end of the chamber, F, the smoke passes down into and backward through the chamber, G, above the bottom plate of the range. The smoke passes from the rear end of the chamber, G, upward through the flue, H, to the chimney.

In the front of the flue, H, and above the oven, D, there is an opening closed by a damper. When this damper is opened the products of combustion pass directly into the flue, but when the damper is closed the smoke and products of combustion pass down the flue, E, and reach the flue, H, through the chambers, F, G.

A cold air pipe, L, leading from outside of the building enters the chamber, M, in the lower part of the range, and is heated. This chamber is divided by vertical partitions to prolong the stay of the air in the chamber, to insure its thorough warming previous to discharging it into the chamber under the oven, and thence through the holes in the bottom of the oven.



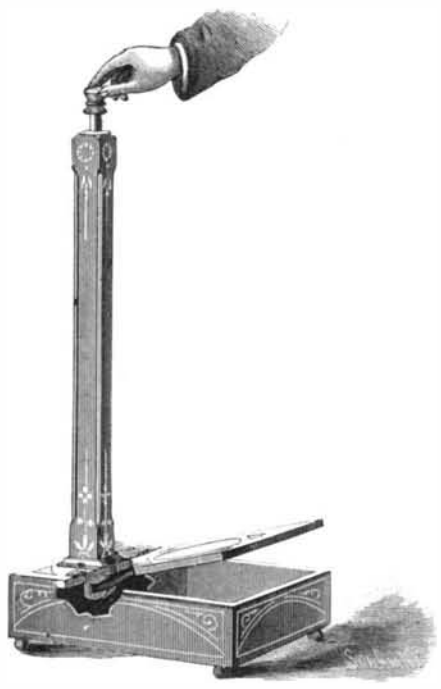
NICHOLSON'S IMPROVED RANGE.

With this arrangement the heated air is distributed through all of the parts of the oven, and comes into contact with the articles being cooked, and greatly hastens the operation of cooking. Another advantage is that the heated air acts first upon the surfaces of the articles being cooked and prevents the juices from escaping, making the articles more palatable.

There are openings from the oven into the flue, H, near the top of the oven, to permit of the escape of the heated air into the flue. These openings are controlled by a damper. Further information in regard to this invention may be obtained by addressing the inventor as above.

SPITTOON HOLDER.

The annexed engraving shows a box or case for holding a spittoon, the case having a hinged lid, and a device for opening and closing it. The box, of suitable dimensions, is provided with a pan, which serves as a spittoon. The lid is hinged to the top of the box near one end, covering only a portion of the top, the remaining portion being permanently attached. A plate or arm, extending rearward, is attached to the hinged edge of the lid between its hinges. To the fixed portion of the top of the box is attached a hollow standard containing a rod, provided at its upper end with a knob, and at its lower end with a fork that extends toward the front of the box, and receives the arm attached to the underside of the lid of the box. When the rod is



CAMPER'S SPITTOON HOLDER.

pressed down the upper arm of the fork bears on the arm and raises the lid. If the lid is not raised beyond a vertical line, it will fall of its own weight when the pressure is removed from the rod, but if the lid falls back so as to rest against the upright hollow standard, it will be necessary to pull up on the rod, when the lower branch of the fork will engage with the arm of the lid so as to close it. This device is not unsightly in appearance as ordinary spittoons, and is not liable to be upset. It is the invention of Mr. James Camper, of Saguache, Col.

Guacha-Maka Poison.

At a recent meeting of the Physiological Society of Berlin, Dr. Schiffer described in detail the effects of guacha-maka poison. An extract was made from the wood of the poisonous plant, which, like curare, is soluble in water and alcohol, and gives the general reactions of an alkaloid. The effects of the extract were tried on frogs, pigeons, and rabbits. A latent period of about fifteen minutes was always noticed. This was followed by a loss of vital and motor powers, although the activity of the heart and of the organs of respiration was not impaired. When small doses were given, the animals recovered after a few days; when large doses were given, the impairment of their powers ended in producing death. The muscles could be stimulated directly, but not indirectly, through the medium of the nerves. The guacha-maka poison had, consequently, exactly the same effects as curare. The circumstance that both these poisons must be administered in twenty-five times as large quantities, when given by the mouth, than when administered hypodermically, gave origin to some attempts to discover the reason of this difference. It was determined that these poisons are neither very rapidly thrown out of the system in the urine, when they have been absorbed, nor are there substances present in the alimentary canal which decompose them. The probable cause of the difference is, that these poisons are with difficulty absorbed from the stomach.

COST of one horse power per hour, as follows, from experiments lately made at Carlsruhe.

		Cents.
100 H. P	steam engine	1·90
2 "	"	11·07
2 "	Lehman caloric engine	6·62
2 "	Hock motor	2·00
2 "	Otto gas engine	6·52
2 "	Otto-Langen gas engine	6·52
2 "	Schmidt water engine (fed by city water supply)	23·75
	Horses	11·10
	Men	50·00

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INAUGURATION OF THE NEW EDDYSTONE LIGHTHOUSE.

(*Continued from first page.*)

The Eddystone rocks, which are of gneissic formation, consist of three reefs, the western, southern, and northern, with odd rocks dotted about irregularly. The old tower—Smeaton's, now in course of demolition—stands upon the northern extremity of the western reef. The new tower, just completed, stands at the northern extremity of the southern reef, the middle of the three. The whole group of rocks occupies nearly a square mile at low water, and stands a little to the north of a direct line between the Start Point in Devon and Lizard Point in Cornwall, being about forty miles from the former and thirty from the latter. The distance between the two towers, from center to center, is only 127 feet. The height of the focal plane of the light in the old house was 72 feet above high water, and was visible thirteen miles, while that in the new house is 133 feet, and is visible seventeen and a half miles.

On Thursday, May 18, 1882, the new lighthouse was set in operation by His Royal Highness the Duke of Edinburgh, as Master of the Trinity House Corporation, who have the charge of all lighthouses round the British coasts.

The Duke went to the Millbay Docks, where he was received on board his old ship, H.M.S. Galatea, which at once moved into the Sound. She was followed there by the Trinity yacht Siren and the Harpy, which contained the Mayor and Corporation of Plymouth. The Carron, with the Mayor and Corporation of Devonport, and the Vivid, the yacht of the Port Admiral, Sir Houston Stewart, were waiting off the pier, and with the Triton, Trusty, Perseverance, and other government steamers, joined in the procession, followed by a number of private steamers and by a whole fleet of yachts. The Galatea led the way, closely followed by the Siren, the Vivid and the Harpy coming next in order. The ships in port were dressed with flags from sunrise, and as the royal standard was hoisted salutes were fired from the citadel and men-of-war. The weather was brilliant. As the Galatea passed through the Sound two American corvettes, the Portsmouth and Saratoga, which were lying there, dressed colors and fired a royal salute. The run out occupied about an hour and a half. The coast of Devon and Cornwall, from the Prawle Point to the Dodman, was distinctly visible, and the sea was covered with craft of all sizes, from tiny fishing boats to ocean mail steamers on their way up channel. The Eddystone was reached at a quarter past eleven, and the vessels grouped themselves around the reef. This is well shown in our engraving, which is from the *Illustrated London News*. Altogether 9,000 persons were present at the Eddystone at the time the light was inaugurated; but the ceremony was not participated in by more than a select few of those on board the Galatea, with the addition of Mr. C. F. Burnard, the Mayor of Plymouth. The Duke of Edinburgh landed on the Eddystone Rock about half past eleven. A prayer was offered by the Rev. Dr. Wilkinson, the lamps were lighted, and the machinery which sets in motion the fog bell was started by the Duke of Edinburgh. Everything was found in the most perfect order. The ceremony over, cheers were raised by the party at the lighthouse, and taken up again and again by the occupants of the steamers which lay around. The Duke then embarked amidst another round of cheers, and the start homeward was speedily made, the Galatea and the Siren being this time the last to leave. The run back was made at full speed, after the Galatea had steamed round the American vessels in the Sound, which manned yards in honor of the visit. Millbay Pier was again reached a little after two. Here an address was presented by the Mayor and Corporation of Plymouth, and his Royal Highness drove from the pier to the Guildhall to attend a luncheon, given by the Mayor, Mr. Burnard. The magnificent hall was splendidly decorated. The company numbered over two hundred, and included the Duke of Edinburgh and elder brethren of the Trinity House, Admiral Sir Houston Stewart, and other heads of departments in Plymouth and Devonport, Commodore Luce and the officers of American vessels in the Sound, the magistrates and members of the Corporation of Plymouth, Devonport, and Stonehouse.

The Mayor, on rising to propose the health of the Duke of Edinburgh, said: "I may say that when I suggested to his Royal Highness, as I did, that we had not expected our American cousins on this occasion, and that it would be desirable to recognize their attendance, he at once expressed the pleasure it would give him to propose the toast of their healths. (Great cheering.) I have now to propose the health of the Corporation of the Trinity House, including the health of his Royal Highness, the Master." (Cheers.)

His Royal Highness, in concluding his remarks in reply, said: "I beg to thank you once more for the way in which you have drank to the health of the Trinity Brethren, and more particularly for the way in which you have associated my name with the toast. (Loud cheers.) The fact has been alluded to more than once by the speakers who have addressed this assembly, that we have among us to-day representatives of our Transatlantic cousins. I ask you to join with me and with the Brethren of Trinity House in welcoming among us Commodore Luce and the officers of the American squadron." (Loud cheers.)

Commodore Luce, was enthusiastically received, and said: "Your Highness, your Honor the Mayor, and gentlemen, I esteem it a great privilege to be present to-day to speak in the name of Americans. (Cheers.) As Americans, it is good for us to be here. (Cheers.) The very name of Plymouth recalls to mind the Pilgrim Fathers—(cheers)—and reminds us of Plymouth Rock in New England. As it has been happily expressed, the ocean does not divide but knits Old and New England. (Loud cheers.) Our traditions date from this country. (Cheers.) When my distinguished friend Admiral Sir Houston Stewart, reverted to the fact of Sir Francis Drake playing bowls upon Plymouth Hoe, just before he and Hawkins and Howard of Effingham, set out to meet and defeat the Spanish Armada, I was reminded that it was just as much the New England as the Old that was interested in that great epoch. (Cheers.) The Pilgrim Fathers and the Plymouth Rock are inseparably associated by us in America. And I would go further and ask what American there is who has not been nurtured in the English classics, and what American there is who has not had instilled in him the early English instincts of civil and religious liberty? (Cheers.) As the Old England has given light to the physical world, let us hope that it may continue to give light to the moral and religious world." (Cheers.)

Commodore W. B. Hoff, of the Portsmouth, Commander Henry C. Taylor, of the Saratoga, and Flag Lieutenant A. Ward were also present at the luncheon.

The Office of Resinous Matters in Plants.*

It has been difficult to make even a plausible conjecture of the uses of the "proper juices" of plants. In their production a large amount of nutritive material is consumed; and for the most part they are stored up irretrievably in the plant, not being reconverted into nutritive material. This gave some color to the old idea that they are excrementitious. But, besides that under normal conditions they are not excreted, why should a pine tree convert such an amount of its assimilated ternary matters into turpentine, which is merely to be excreted? Or, if it be a by-product, what useful production or beneficial end attends the production? If excrementitous, the tree should be benefited by drawing it off. But, as De Vries remarks, and as the owners of the trees very well know, the process is injurious, and if followed up is destructive. It goes almost without saying nowadays, that the turpentine is of real good to the tree, else turpentine-bearing trees would not exist. De Vries has made out a real use, which he thinks is the true function of the resiniferous matters in *Coniferæ* and in other resin-producing plants. Resinous juice is stored in the tree as *a balm for wounds*. It is stored up under tension, so that it is immediately poured out over an abraded or wounded surface; for these wounds it makes the best of dressing, promptly oxidating as it does into a resinous coating, which excludes the air and wet and other injurious influences, especially the germs or spores which instigate decay; and so the process of healing, where there is true healing or reparation, or of healthy separation of the dead from the living tissues, is favored in the highest degree. The saturation of the woody layers with resin, in the vicinity of wounds and fractures (as is seen in the light wood of our hard pines, is referred to as effectively arresting the decay which parasitic fungi set up, this "fat" wood being impervious to mycelium.

Latex or milky juice is a more complex product, of which certain portions have been shown to be nutritive; but as to the caoutchouc and the waxy matters they contain, De Vries insists that they subserve a similar office, are, in fact, a remedy—a protection against decay, a natural provision for the dressing of wounds, under which healing may most favorably proceed.—*American Journal of Science.*

DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

LEHNBEUTER *et al. vs.* HOLTHAUS *et al.*

Decided March 6, 1882.

DESIGN PATENT.—An immaterial variation of the design—such as a slight inclination backward, hardly perceptible to the eye, of the glass constituting the front of the elevated parts of a show case—does not relieve from the charge of infringement.

It is immaterial to the patentability of a design whether it is more graceful or more beautiful than older designs. It is sufficient if it is new and useful. The patent is *prima facie* evidence of both novelty and utility, and neither of these presumptions has been rebutted by the evidence.

Appeal from the Circuit Court of the United States for the Eastern District of Missouri.

Mr. Justice Woods delivered the opinion of the Court.

LICENSE.

In the case of Searls *vs.* Bouton *et al.*, United States Circuit Court, Southern District of New York, Judge Wheeler holds as follows:

The defense of non-infringement rests upon a license granted by the orator to John O. Merriam and Edwin Chamberlain "to manufacture" at their shop in Troy, New York, and no other place or places. This appears to be a personal license, not transferable, and a license to make only. Merriam and Chamberlain had a shop in Troy and constituted a firm. Merriam appears to have sold out to a new firm composed of Edwin Chamberlain and Perry D. Randall. Edwin Chamberlain has since died, and Edward Chamberlain has succeeded him in the firm of Chamberlain & Randall. Merriam appears to have ordered materials, or to have permitted Chamberlain & Randall to order them in his name, for use in making whip sockets at that shop, but he does not appear to have been engaged himself in the manufacture. Sockets made under and pursuant to the license would be free to the trade, but sockets merely dealt in by the licensees would not thereby be made free. The defendants have not made it clear that the sockets they have sold, which would otherwise be an infringement, were made under and pursuant to the license. Therefore they must be adjudged to have infringed. The extent of the infringement unlawfully done must, of course, go to the master for determination.

United States Circuit Court—District of Indiana.

HAPGOOD *et al., vs.* HEWITT.

Decided March 22, 1882.

RIGHTS OF EMPLOYERS AND EMPLOYES IN PATENTS.

Gresham, J.:

Persons are not deprived of the right to their inventions while in the service of others, unless they have been hired and paid to exercise their inventive faculties for their employers.

A contract by which one person agrees to pay a sum of money for the time, labor, and skill of another for a given period gives the employer no right to an assignment of a patent that is issued to his employe for an invention made during the period of his employment.

If under such a contract of employment the employer has any right to the invention, it is a mere naked license to make and sell the patented improvement as a part of its business. This right, being a mere personal one, is not transferable, and is extinguished with the dissolution of the corporation which exercised it.

This was a suit brought by Charles H. Hapgood, James H. Hesse, and John Parker, trustees of Hapgood & Company, a defunct corporation organized under the laws of the State of Missouri, and the Hapgood Plow Company, a corporation organized under the laws of the State of Illinois, against Horace L. Hewitt. The relief sought is a decree compelling the defendant to assign to the Hapgood Plow Company as the successor of the Hapgood Company, or to the trustees of the last named company, in trust for the Hapgood Plow Company, certain letters patent which the defendant caused to be issued to him for improvements in iron sulky plows.

The bill is demurred to for want of equity. Demurrer sustained.

SMALL DYNAMO-ELECTRIC MACHINE.

In SUPPLEMENT 161, February 1, 1879, I described a small dynamo-electric machine, giving working drawings, together with all the particulars necessary to enable any machinist or amateur, whether familiar with electricity or not, to construct a working dynamo of small but practical size. This machine has been copied by a large number of the readers of the SCIENTIFIC AMERICAN, who have succeeded very well indeed; others, however, have failed. In the most of these failures of which I have been informed the cause has been evident enough, and should not have been overlooked by the builder of the machine.

One has an armature of very hard iron—a sufficient cause for failure, since the magnetization of the armature is reversed at each half revolution. Another has a wide space between the armature and field magnet. Another finds the wires of his magnet wound so that both poles are alike. Another discovers that his armature is short circuited, and another has found the same trouble in the wire of his field magnet. Still another finds that the commutator needs adjusting. Another has oiled the commutator, and there is not enough pressure on the commutator springs or brushes to press the oil out of the way, and the oil being a good insulator prevents the current from passing. Another finds fine particles of copper between the halves of the commutator; this, of course, short circuits the armature. Another has varied the sizes of the wire on the magnet and armature. Some expect the machine to work through large external resistance, and so on. In nearly every case the only possible advice has been to follow the instructions given in the SUPPLEMENT referred to.

Several inquiries relating to the kind of wire gauge used in giving the sizes of the wire, the electrical resistance of the magnet and armature, and the performance of the machine in connection with Edison's lamps having been referred to me, I will briefly give the following points:

Field magnet wire, No. 16, American wire gauge.
" " " between Nos. 17 and 18, English wire gauge.
" " " 0·055 inch diameter.
" " resistance of 1·9 ohms.
Armature wire, No. 18, American wire gauge.
" " " 19, English " "
" " diameter of 0·04 inch.
" resistance of 0·9 ohm.

The current from this machine will bring four Edison 3-candle power lamps to incandescence, and will light two of them with great brilliancy, the machine being turned by hand.

GEO. M. HOPKINS.

Fast Steamboat Time.

On Thursday, May 25, the Mary Powell made the trip up the Hudson River from New York to Rondout, 95 miles, in 4 hours and 17 minutes, beating her best previous time by 10 minutes. This is at the rate of 22⅓ miles an hour, and included the time taken in making eight landings.

* By Hugo de Vries. A paper in the *Archives Néerlandaises*, vol xvii. 1882. The extract fills 24 pages 8vo.

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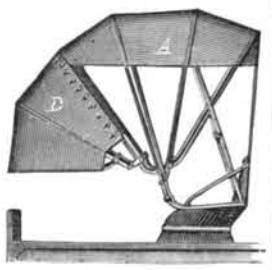
MISCELLANEOUS INVENTIONS.

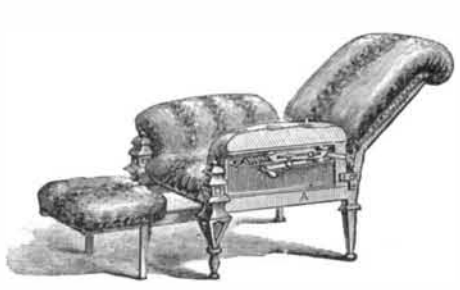
Extension Carriage Top.

The object of the invention shown in the annexed engraving is to provide vehicles that have folding tops of the ordinary construction, with an auxiliary top, D, to be attached when desired to the front part of the ordinary top, so as to extend its projecting area, and may be removed when not required for use. In the engraving A is an ordinary carriage top, to the front bow of which are attached knobs upon its upper and outer sides. The auxiliary top has two bows, the ends of the forward one being hinged to the rear bow near its ends. The ends of the rear bow are hinged to a hook formed upon a U-shaped clamp. This clamp is lined with rubber, and is of such size and shape as to fit upon the front bow of the top, and is held firmly to it by a thumb bolt that passes through the ends of the clamp. To these bows a cover is attached of material to correspond with the cover of the carriage top, the rear edge of which is secured to the knobs on the front bow; and to the auxiliary bows are attached jointed brace bars, so that the auxiliary top may be folded up or extended, as may be desired. In openings in the middle part of the cover are secured glass plates to enable the driver to see the road in front of his team. When not required for use the top may be detached and folded to place beneath the seat of the carriage. This invention is patented by Mr. Richard J. Parrett, of Portland, Jay county, Ind.



Reclining Chair.

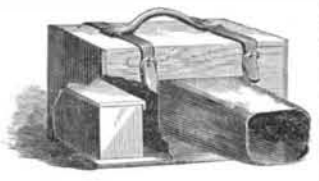
Improvements relating to the class of chairs having pivoted backs adjustable by ratchet mechanism, secured to stationary arms, have recently been patented by Mr. Morris S. Allen, of Brooklyn, Kings county, N. Y. In the engraving A is the seat frame provided with fixed side arms and a hinged back. The arms are grooved at their under side, and in the grooves are placed longitudinally slotted plates, screwed to the arms, to which rack bars are held by headed pins that pass through the slot, the racks being free to move endwise. Bars are pivoted to one end of the racks, the other ends being attached by hinges to the back of the chair. Springs are attached to the arms of the chair and to the ends of the rack bars in such a manner that they tend to draw the racks and bars endwise and raise the chair back. Pawl levers are pivoted on the fixed slotted plates, that have their inner ends bent at right angles to engage the rack bars, and at their outer ends are knobs extending to the outside of the arms, for convenient handling by the occupant of the chair, who brings the back to the position required, by raising the handle ends of the levers and leaning backward, and is held against return as soon as the levers are released. To raise the back it is only necessary to raise the levers, when the springs will draw the back up.



Portable Dark Room for Dry Plate Photographing.

The invention shown in the accompanying engraving is a portable dark room, consisting of a box made of suitable material, and provided with straps and a handle for carrying, and having an aperture from which a flexible sleeve of proper material projects from the box. The opening and sleeve must be of such size as to permit the plate holder of the camera to be passed through them into the box. Two compartments, provided with lids, are located at either end of the box, one containing dry plates that have not yet been exposed, and the other the exposed plates.

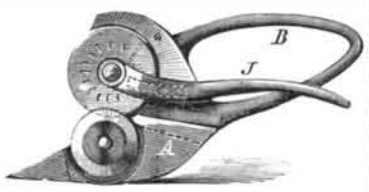
The operator passes the plate holder through the sleeve into the box, opens the frame, and deposits the exposed plate in its proper compartment, and takes a fresh plate from the opposite compartment and places it in the plate holder, which is then withdrawn. In this manner the plates are placed in or removed from the plate holder without being exposed to light or dampness. While manipulating the plates with one hand the flexible sleeve is held against the arm with the other hand, so that no light can pass into the box by accident. The box also serves as a receptacle for transporting plates. This ingenious device is patented by Mr. John Serdinko, of New Braunfels, Comal county, Texas.



MECHANICAL INVENTIONS.

Cutting Mechanism.

A new and ingenious mechanism for cutting paper, cloth, leather, sheet metal, etc., rapidly, and with a clean sharp edge, patented by Mr. Sandor Danheim, of New York city, is shown in the accompanying engraving. The metal frame, A, is provided at one end with a handle loop, and at the opposite lower end with a triangular sharp edged knife, from the end of which the frame is gently curved backward and upward. Two sharp edged cutting disks are journaled to the frame in such a manner that the disks must overlap each other slightly, and must also be in contact. The lower disk must not project beyond the lower edge of the frame so as to deface the table upon which it rests. A lever, J, is loosely mounted upon the journal of the upper disk, and is provided with a spring pawl that catches in notches on the side of the disk. When the handle is seized, and pushed forward, the edge of the material that is to be cut slides up the knife, upon the edge of the lower disk, and is cut by the action of the two disks. If the material to be cut affords too much resistance to permit moving the instrument forward, the upper disk may be rotated by means of the lever, J, or the handle and lever may both be seized at the same time, and the instrument pushed forward while operating the lever. If it is desired the handle and lever may be placed at the opposite end, and the instrument be drawn instead of pushed.



Load Binder.

A novelty in devices for binding loads, which consists of headed lever provided with a chain and hook mechanism for attaching the binding chain, so that loads of lumber, merchandise, or other commodities may be securely and easily bound upon a wagon or other vehicle, and it is simple, easily handled, powerful, and inexpensive. This device is patented by Mr. Stephen S. Conkling, of Middletown, Orange county, N. Y., and is shown in the accompanying engraving. In the engraving, A is the lever, and B the head, and they may be made solid, of malleable cast iron, or of wood and iron combined. The head is circular in form, and grooved on its circumference to receive the chain, and also has extended straps which receive and hold the lever. Upon one of the straps is formed an eye to which one end of the hooked chain is attached. The head is perforated near its center, for the passage of a bolt or pin which secures a clevis to the head, the clevis being provided with a swiveled eye to which is attached a hook to hook into the binding chain. The free end of the lever is provided with a chain by which the lever is secured after being brought to bind the load. In use the swiveled hook and the hook at the end of the chain that passes over the head of the lever are to be hooked in the binding chains, with the lever standing toward the swiveled hook, and then to bind the load the free end of the lever is forced down and secured to the binding chain. The distance from the pivot to the outside of the head is very short, and furnishes a powerful leverage, making it possible to make the device small and compact and still furnish ample power.

Car Mover.

Mr. James D. Lawrence, of Carroll, Carroll county, Iowa, has patented a new and ingenious device for moving cars short distances in switching and coupling, etc., which is clearly shown in the annexed cut. The lower edge of a lever, A, is rounded at its lower end, and at a short distance from this end a forked pintle is pivoted to it by means of a bolt. On this pintle two opposite jaws are pivoted and are secured to it by a nut at its lower end. On the bolt that connects the pintle and lever a U-shaped clevis is mounted in such a manner that it hangs down from the lower edge of the lever. When the ends of the opposing jaws are placed against opposite sides of a car wheel, and the lower end of the lever, A, is rested on the tread of the wheel, and the outer end of the lever is raised, the jaws will be firmly pressed against the sides of the wheel, and by their grip the wheel will be turned and the car moved. The clevis hanging vertically rests against the outer edges of the jaws, and by its weight presses them together sufficient to enable them to take a firm grip when the lever is lowered without their adjustment by the hand.

THE PARADOX WHEEL.

So called from its appearance; for, seeing that all the internal parts, *a b c d* and *e f g h*, are pivots which support the whole of the internal parts, and that the cross in the center is also free on the axle after the manner of a pair of scissors, a collapse appears inevitable; whereas the axle continues as firmly in the center as in the ordinary wheel with fixed spokes, and the elastic tire gives way, and flattens on the ground with the same freedom as if the load were merely placed on the top of the elastic tire; and (as I shall show) gives us a base equal to the sleepers which (on a railway) support proportionately a locomotive engine (See Fig. 1). This wheel might also be named the leg wheel, or the walking wheel, from its appearance.

By publishing this invention, I am showing to our readers my "trump card;" for so important is a means of reducing the horse power required for traction on a common road to the same low amount (for the same load) as is required on a railway, that its general adoption would amount to a revolution in locomotion on common roads.

I am aware that others have tried to effect the same object; but one mistake has been to make the internal part of a wheel elastic; whereby the load only descends nearer to the ground, instead of the tire becoming uniformly flat next the ground, as is the case in this invention. In other designs the two wheels on each side have not been independent of each other, whereby guiding has been prevented.

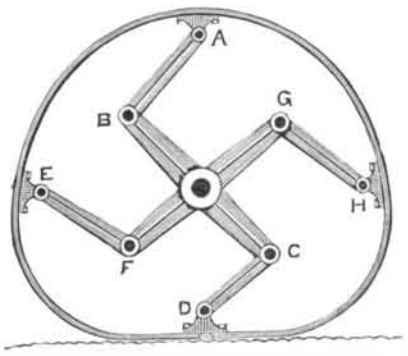


Fig. 1.

In order to show that my object has been attained, I will explain why it is that so great a proportionate tractive power is required on the common road.

The common wheel acts somewhat after the manner of a cheese cutter, and grinds to powder annually millions of tons of road metal, and also falls into, and has to be dragged out of every rut, little and big; this amounts to a lot of uphill work, and accounts for the extra power required. By the adoption of my invention these evils are avoided; as there is always a base or foundation sufficient to make the tractive power no more than that of a railway on the same gradients—mind, I say, on the *same* gradients; which we know are more favorable on a railway.

Fig. 2.

To compare, let us suppose a cart has 5 foot wheels, and the tire to flatten one-eighth, or about 2 feet; width, say, 4 inches; total surface bearing, 1 foot 4 inches; and, say, total weight, 1½ tons. Now, a locomotive engine will weigh about twenty-four times this, which, × 1 foot 4 inches = 32 feet super. for sleepers, which, divided by, say, 5 sleepers, gives each 8 feet 7 inches long by 9 inches wide, which is not far from the truth.

The tires should be one piece of spring steel, tempered clock spring, of width and thickness as engineering data may dictate. The ends of the tire may be riveted to the bearing, same as the other three, but the ends must be shut into the dovetail, cast as part of *one* of the four bearings, which is shown at bottom of Fig. 2. The other parts of the tire should be *malleable* cast iron.

Other advantages resulting are, that carriage springs are needless, the tires being themselves the springs; and all noise, jolting, and vibrations are done away with, so that the motion will be as easy as can well be imagined.—*J. H. Huxley, in English Mechanic.*

Eighty Miles of Dead Sea Fish.

The brig Edward Hatton, Thomas Simmons master, arrived at this port, May 28, from Pointe-à-Pitre, Guadeloupe. Captain Simmons reports that on the outward and homeward passages his vessel encountered vast numbers of apparently dead fish. "They were all on their backs," said the captain to a *Herald* reporter, "and were from two to four pounds each in weight. They all had a bloated appearance. At first sight I took them for cod, but further observation convinced me that they were what is called drum fish. Their fins kept moving, which gave to the fish an appearance of life, but the movement was doubtless caused by the waves. The vessel ran across them between latitude 39 and 37½. They were inside the stream in deep soundings. We kept among them for a distance of from sixty to eighty miles."

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WAVE POWER MACHINE.

GAUCHEZ'S PROJECT FOR UTILIZING THE OSCILLATIONS OF THE OCEAN.

As well known, the ocean forms an immense reservoir of motive power, perhaps the greatest in nature, and one whose energy is expended to no purpose. The incessant agitation of its waves and the oscillation of its tides are absorbed without profit in polishing the rounded pebbles on the beach, or in merely modifying the contour and relief of the coasts against which they continually beat. There is here an enormous power, which, so to speak, offers itself of its own accord, and entirely gratuitously; for it is derived from the sun, as are all the forces that we employ on earth. Nor is there any danger of the supply giving out, as some persons have begun to fear with regard to coal, which is merely the heat of the sun that has accumulated for ages, and which has remained up to the present time the daily bread of the industries. For this reason there has for a long time been sought a method of collecting this power by motors adapted for making it serve a useful purpose to the needs of man, as has been successfully done with water courses. Yet the numerous experiments made in this direction have never as yet yielded apparatus that were really practical; and, moreover, the success obtained in one day with the steam engine has completely turned attention away from this question of the utilization of natural forces. Nevertheless, the steam engine is far from being an economical and advantageous apparatus from the stand point of rational mechanics; and, without going so far as to say with M. Le Bon (*Revue Scientifique*, Oct. 8, 1881), that "the last specimen of this rude apparatus must, before the end of twenty years, go to join the stone axes or our primitive ancestors in the museums," we cannot forget the fact that it does cause a true waste of motive power, since its effective work scarcely exceeds ten per cent of the stress exerted; nor is it even to be hoped that any important progress can be effected, notwithstanding all the improvements of which it is the object, since the maximum and theoretic performance determined by the physical properties of steam, is limited to about 20 per cent.

The recent progress made in electrical machines is at present attracting attention to the subject of the cheap production of power; and now that an intermedium is being arranged which is capable of transforming and utilizing at a distance the motion produced, for all sorts of applications, electric motors will finally dethrone the steam engine, when they shall no longer be obliged to call upon it for their motive power.

The utilization of natural forces is, then, called on to perform a decisive role in the mechanics of the future; and there is reason to hope that this question, now definitely proposed, will receive its solution in a not very distant future. Such being the case, our readers will read, not without interest, a few details that we shall here give regarding some recent experiments, especially regarding Mr. Victor Gauchez's apparatus, which figured at the Brussels Exhibition of 1880. M. de Coligny had succeeded, before M. Gauchez, in utilizing the oscillating motion of the waters of the sea for raising water to a certain height, and his apparatus has been applied successfully in drying lakes in the vicinity of the coast. M. de Coligny is likewise the inventor of a most ingenious apparatus, founded on an analogous principle, which permits of collecting in the locks of canals a portion of the volume of water that is uselessly given out when a boat passes from one level to another, by carrying it back to the upper level again. He utilizes only the elevation of level that the waters assume when they are undergoing the effect of an oscillating motion, or what is called the ram stroke, resulting from a suddenly interrupted current. Properly maneuvered, it appears that his apparatus is capable of economizing a volume of water reaching 70 per cent. of the unprofitable outflow from an ordinary lock, and sometimes even 90 per cent., according to an experiment made with it on a lock near Fourchambault.

Some experiments have also been undertaken to directly utilize the motion itself of ebb and flood, by collecting the water at high tide in large basins, from which it afterwards flows out to furnish the motive power at low tide. In the Department of Finistère it has been found possible to actuate a mill by this process, which has been applied likewise, under a different form, at Alexandria, in Egypt. The trial has also been made, but without much success, to compress air into large submerged bells which became filled with sea water at high tide.

Besides the tides, the motion of the waves themselves on the surface of the sea may be utilized. In this case it becomes necessary to set up the apparatus at a certain distance from the coast, so that it may not be interfered with by the tide; and, on another hand, the power that it is desired to store up becomes much more capricious, and very accidental and variable in its effects, from the simple swell that gently ripples the surface to the furious wave that sometimes reaches several meters in height, and occasionally capsizes boats. But this undulating motion of the wave is very easy to seize; for it is propagated, in fact, under the same conditions as sound and light, that is to say, the molecules of water, like those of air or ether, are alternately raised or depressed without there ever a longitudinal motion occurring. It is easily ascertained, moreover, that a light body floating on the surface of the sea does not change place, and for this reason there may be installed without difficulty a simple oscillating float, located at the extremity of a lever, whose axle may thus be given a rotary motion. Such an idea as this, put forth some time ago by Mr. Roche, of Nimes, who has made some experiments with regard to this subject on the Mediterranean, has been taken up in a more general way by Mr. Victor Gauchez, in the apparatus shown in Figs. 1 and 2, and by employing the intermedium of compressed air, which is stored up in reservoirs to be afterward distributed as wanted. Such an arrangement presents the advantage that the power is stored up, and dangers of a stand still are prevented. Mr. Gauchez's apparatus consists of a float weighing anywhere between 40,000 and 100,000 kilogrammes, according to its dimensions; of an iron compressing bell, connected with the float by cords passing over pulleys, as shown in Fig. 1; and of air reservoirs, withstanding a pressure of twenty-five kilogrammes, located on the coast and connected with the compressor by special conduits (Fig. 2).

The float rises or descends with the wave, and, in its descending motion, raises the bell through the intermedium of the two cords wound in opposite directions on the pulleys. In this motion the belt sucks in air through apertures in the upper part, and when the cords slacken while the float is rising, it falls back by its own weight and forces the air into the reservoirs. The bell is closed at the lower part by a rubber membrane attached to the masonry which supports it. The length of the chains is limited in such a way as to follow the tide only, from the half-swell at ebb-tide to that at flood-tide, supposing the highest bar does not exceed three meters. In this way the slightest swells are utilized, and those irregularities are avoided which are frequently occasioned by abnormal tides.

The great difficulty that this arrangement, otherwise so simple, will present, will be that of preventing the exaggerated heating of the air, and especially that of insuring a rapid flow of it into the reservoirs; for the waves succeed each other, in fact, every nine or ten seconds on an average, and it is necessary in this so short an interval of time to fill and completely empty the bell. The inventor foresees that the latter may have a diameter of about 25 meters with a total height of seven meters, and weigh, with all its appurtenances, 600,000 kilogrammes. Its travel might be limited to two meters, so as to suck in only a volume of 800 or 900 cubic meters of air. It would be necessary to reduce the dimensions of the orifices in order to limit the entrance of air, and, on another hand, to provide the bell with strong safety-valves in order to insure of a flow of a portion of the air into the atmosphere, when the pressure, having become somewhat high in the reservoir, would prevent the introduction of the whole volume.

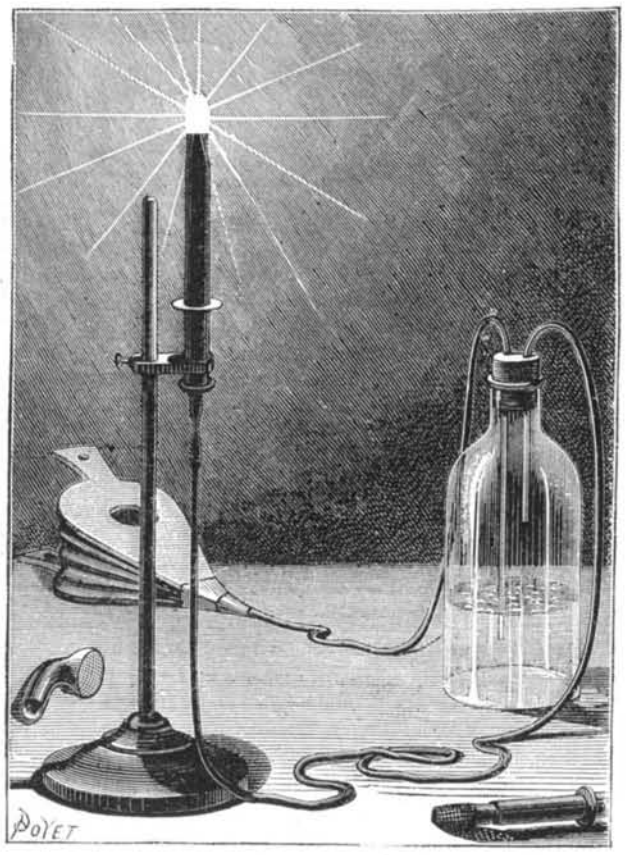

Fig. 1.—Float and Iron Compressing Bell.

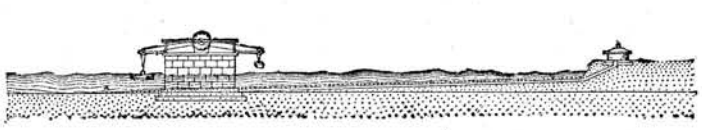

Fig. 2.—General Arrangement of the System, Showing the Air Reservoir on the Coast.

We shall not dwell on these grave difficulties of execution; for, in a question of such a nature, they can scarcely be decided by a simple calculation, and the model, a very careful one, by the way, constructed by Mr. Gauchez on a scale of one-tenth, can give only an approximate idea of what the apparatus will in reality become. However, there is reason to think that there is nothing insurmountable in these difficulties, especially in the presence of the progress already realized in the great works of Mont Cenis and St. Gothard, where compressed air was employed under pressures that were likewise very great. And probably we shall one day be permitted to see, at least in a preliminary application, the most powerful, perhaps, of natural forces put at the service of the industries by means of Mr. Gauchez's apparatus, which will, if necessary, be improved without doubt.—*La Nature.*

REGNARD'S INCANDESCENT LAMP.

DR. REGNARD'S INCANDESCENT LAMP.

There has for a long time been sought a process for obtaining a bright light which should permit of projections being easily made. In places where electric lights exist the thing is very simple; and it is also easy in places where there is gas, but then oxygen being necessary the apparatus became quite difficult to arrange and move about. But in all localities where even gas does not exist it becomes absolutely necessary to dispense with a method of teaching, which, it is generally agreed, is an excellent one.

Quite recently the Minister of Public Instruction requested a special commission to design for him an apparatus that might be readily used in primary schools for making projections. The result of this commission's examination is that even if simple apparatus for projecting be not wanting, we are very far from having luminous foci sufficiently intense for obtaining somewhat enlarged images.

Dr. Regnard has conceived the idea of obtaining a very brilliant light by burning a mixture of air and vapor of petroleum on a platinum gauze. There results from this an intense heat, which raises the platinum wires to a white heat, and thus produces a light about half as bright as that of the oxyhydrogen light. The apparatus is very simple, consisting of an ordinary Bunsen burner terminating in a little cage of platinum wire. Instead of supplying this burner with gas, there is forced into it a mixture of air and petroleum vapor, according to a process known for a long time, and utilized recently by the numerous inventors of thermo-cauters. A simple kitchen bellows or a syringe bulb is quite sufficient to set up the necessary current of air. In order to throw all the light in one direction the Bunsen burner may be covered with a tube having a flaring orifice, like the bell of a trumpet, covered very accurately with a network of platinum wire. In order to obtain an extremely brilliant light whenever the blowing is done, it is only necessary to regulate the flow of the gaseous mixture by the ring of the burner. If, instead of using a bellows, the current of air be forced by a pneumatic machine or tromp, quite a number of lamps may be supplied and made to give a light having the aspect and power of incandescent electric lamps for rooms, factories, etc., in places where no gas exists.

Dr. Regnard's lamp is based on the Bourbouze burner, but is superior to that in not requiring the use of illuminating gas. It has another very great advantage, and that is that it costs almost nothing, and even when operating at a maximum the expense is only a few cents per hour. It will prove of service to physicians for making laryngoscopic and otoscopic examinations.

If it be desired to give the apparatus greater constancy and make it serviceable for regular lighting, we suppose it would be necessary to go to a little more expense and increase the size of the carbureter in order that the impoverishment of the petroleum may not make itself too quickly felt. This may be accomplished by causing the air to bubble through one of those large flasks found in all drug stores, and into which there will be put nine or ten pints, of the liquid. Such a flask may be placed under the table holding the apparatus, or even further off.

If it be not desirable to perform the blowing with the hands, there may be disposed under the table a large blowing apparatus that any one can construct by loading with a weight a bag filled with air. If the bag is tolerably large the lamp will be enabled to operate for several hours without any attention being paid to it. The petroleum product to be put into the carbureter is the ordinary benzine of commerce.—*La Nature.*

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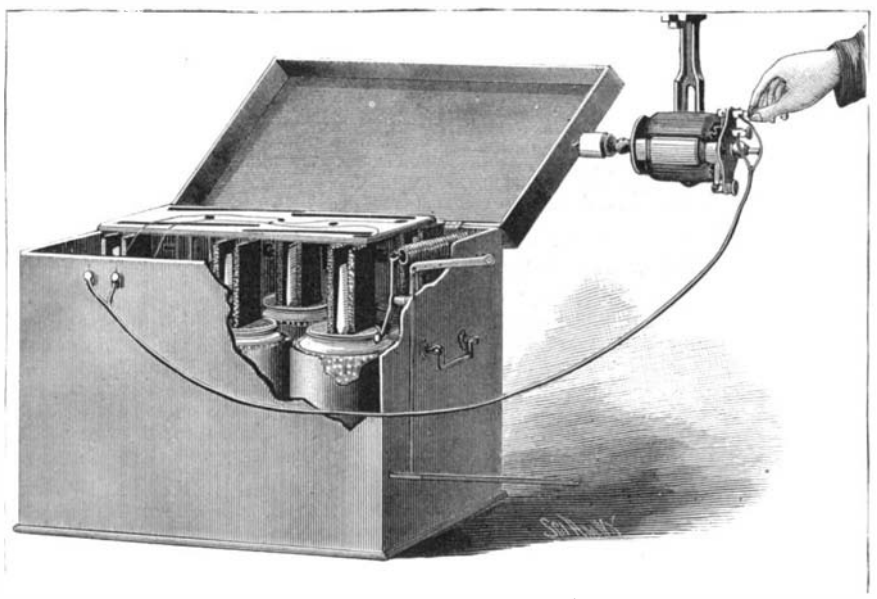
THE DOUBLE INDUCTION MOTOR.

One of the most difficult problems in mechanics has been to produce a safe, compact, economical, and manageable motor for household and other uses requiring only a small amount of power. The motive force has been sought for in various directions, and as the latest result of experience and experiment, electricity has proved itself to be the most available, and in all respects preferable to other motive agents for small power. Among motors employing electricity as a source of power we know of none so simple, so compact, or so powerful in proportion to its size and weight as the double induction motor shown in our engraving. It is the invention of Mr. William W. Griscom, and is manufactured by the Electro Dynamic Company, 121 South Third street, Philadelphia, Pa.

In describing the construction, operation, and advantages of this motor we cannot do better than use a portion of the report of the Franklin Institute of Philadelphia, in which the mechanism is described as follows:

The motor consists briefly of two semi-circular electromagnets, which together form a ring; their poles project inward, and, together with the wire coils, form a cylindrical tube, with which a Siemens armature revolves. The poles extend laterally beyond the ring, forming supports for the brackets which carry the bearings of the armature and the brushes of the commutator. In order to reduce the wear of the journals to a minimum, the bearings are made four times the diameter of the shaft, and the direction of the wear is away from the point of nearest approach, so that the poles of the armature and magnets can never come in contact from this cause—a frequent source of annoyance and danger in former motors.



THE BATTERY.

The battery consists of six one-gallon cells, into each of which plunges a plate of zinc four inches long and two inches wide, and two plates of carbon exposing a like surface.

The large amount of liquid (electropoion) is merely to save the trouble of frequently recharging; a battery containing six drachms per cell gives equal power, but for a shorter period. It is estimated that the battery once charged will continue to supply the motor with efficient power for all ordinary use of a sewing machine, in a private family, for many months, or probably one year, without refilling. It is inclosed in a tight box, which, covered with a cushion, serves as a seat for the operator.

The power of the motor depends upon the quantity of electricity furnished by the battery; this is easily regulated by raising or lowering the zinc and carbon plates in the exciting fluid. It is found that when the plates were partially plunged in the bath sufficient mechanical power was developed by the motor for all ordinary requirements of a sewing machine, and when fully immersed it was more than sufficient to drive a large needle through sixteen layers of cotton cloth at a very rapid rate. The motor is 2¼ inches in diameter and 4 inches long, and its weight is but 2½ pounds; it is securely attached by a light frame to the table of the sewing machine. The entire apparatus is simple in its construction, excellent in all its mechanical details, and its adaptability to general use is not questioned by the committee. The battery differs from the ordinary Grenet form mainly in the automatic arrangement for removing the plates from the bath, and in the large size of the cells, holding one gallon of "electropoion" fluid each.

The method of graduating the strength of the current, and consequent speed of the motor, is as simple as it is effective; a very slight pressure of the foot on the treadle suffices to start the machine as gradually as may be desired; the speed may then be increased up to one thousand or more stitches per minute, which it is said is considerably faster than is now attained by professional sewing women, while others seldom sew more than 300 or 400 stitches per minute.

Two forms of the battery were shown, in both of which the plates are automatically raised above the bath when not in actual use. In one form this is accomplished by means of a spiral spring attached to either end of the bar, to which the plates are permanently fastened. In the other a similar result is attained by means of a counter weight on the small arm of the lever attached to the treadle.

The important novel feature in this battery consists in the size of the cells, which thus enables it to continue operative without recharging for a great length of time, as the current is necessarily intermittent when the motor is running, and as the plates are frequently raised and lowered by the operator, to accommodate the needs of the work of sewing, the main objection to the ordinary Grenet battery, viz., the rapid deterioration when a constant use is required, is avoided to a great extent, while its advantages for household and occasional use are retained. These advantages are: that it generates no gases or vapors that are practically deleterious; the zinc elements do not (as in other batteries) require frequent amalgamation or attention, and when not in use, are simply raised above the fluid, and allowed to drain.

The committee, in conclusion, recommended this electric motor and battery to the favorable consideration of the Franklin Institute, as an apparatus possessing great power in proportion to its size, simplicity in its construction, excellence in its mechanical details, and general adaptability to household use.

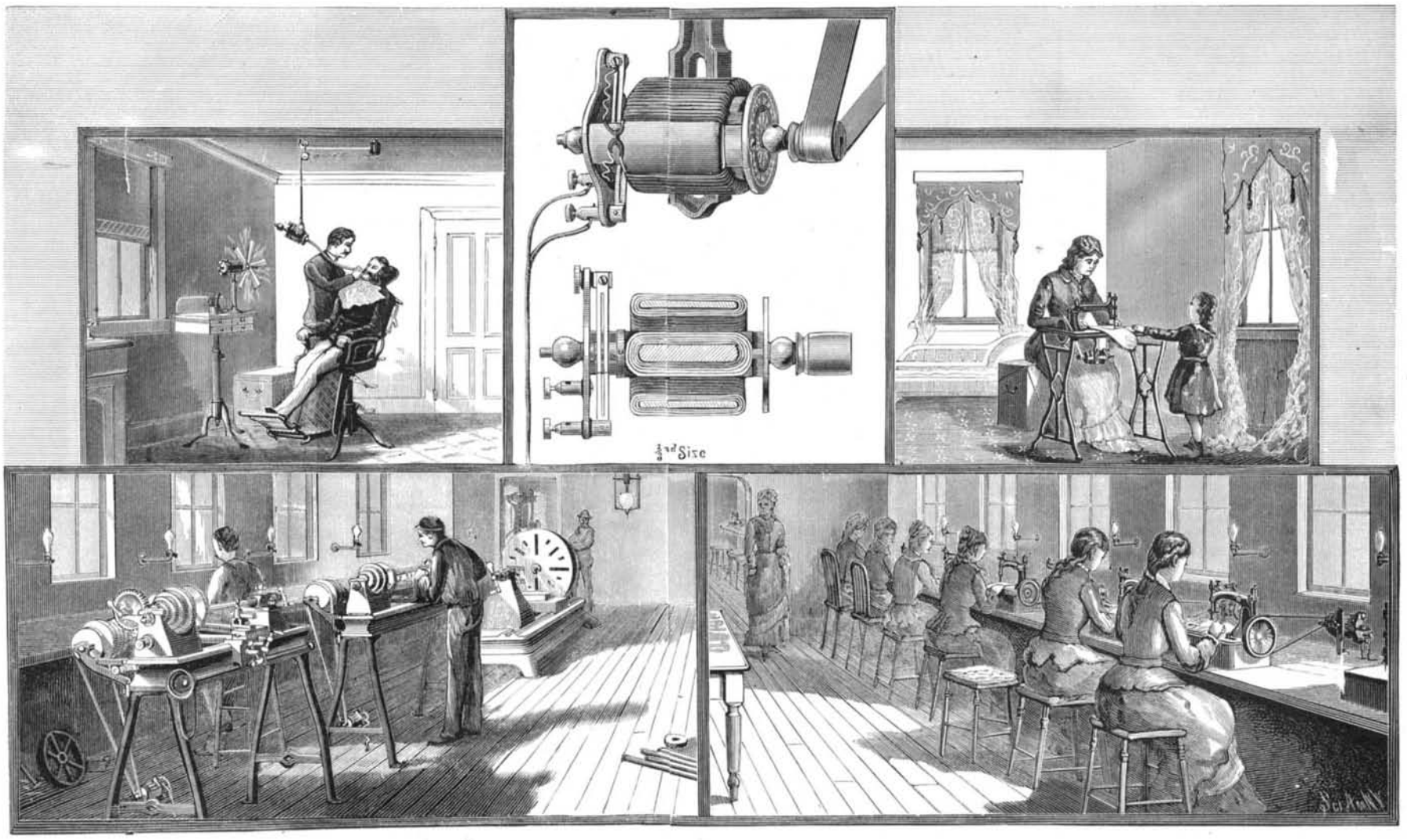
This new electric motor is not only the most compact and powerful small motor we have examined, but it is also low in price.

Any desired information in regard to this motor may be obtained by addressing the Electro Dynamic Company as above.

Proposed Weather Charts of the North Atlantic.

The British Meteorological Office, London, announces that the Meteorological Council propose to undertake the preparation, from observations made by incoming ship masters, of daily weather charts of the North Atlantic Ocean. The work will begin August 1, simultaneously with the commencement of the concerted meteorological observations at the international Arctic stations planted by different nationalities in Kamtschatka, Siberia, Nova Zembla, Northern Scandinavia, Greenland, and Arctic America. The work proposed is tentative, and no signally important results are anticipated in the way of storm warnings, owing to the fact that most British storms come from the west, whence their formation cannot be promptly reported, save as it is now done by the New York *Herald*.

As *Nature* puts it, no decidedly great step is likely to be taken in the improvement of weather forecasting [for Great Britain] as regards time and precision, until either of two things be done, namely, till either a cable be laid to Newfoundland, *via* Faröe, Iceland, and Greenland, or till science has taught us to moor a ship 700 or 800 miles out in the Atlantic, as a floating meteorological observatory, connected by cable with the west of Ireland.



THE DOUBLE INDUCTION ELECTRIC MOTOR.

EPIDEMIC WHOOPING COUGH IN LONDON.—During the first four months of the current year more than 2,500 children were carried off by whooping cough in London. The epidemic began toward the end of last year, and has since prevailed with exceptional fatality.

A LARGE canoe in excellent condition has been found near Bex, 4,000 feet above the sea level and nearly 3,000 feet above the valley of the Rhone. No Lacustrine relics have ever before been found in Switzerland at such an elevation.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

New Quick Adjusting Parallel Bench Vise, with screw clamp. Strictly first-class. Machine made. 4″ size ready. Price $10.50. Address J. Thomson, 9 Spruce Street, N. Y.

Railroad Supplies. Manufacturers' Supplies and Polishers' Supplies. Send for catalogue. Greene, Tweed & Co., New York.

For Sale.—A Beam Engine, condensing; 34 inch cylinder by 48 inch stroke; Sickle's cut-off; now developing 300 horse power by card. Flywheel, 20 feet diameter by 36 inch face. Can be seen running at the Brooklyn City Flour Mills, Jewell Milling Company, foot of Fulton Street, Brooklyn, N. Y.

Wanted.—A large Drill Press. Address James Cuddy, Forty-third Street, Pittsburg, Pa.

JORDAN IRON AND CHEMICAL WORKS, N. 11TH AND 5TH STS., BROOKLYN. June 8, 1882.

H. W. Johns M'f'g Co., 87 Maiden Lane, New York:

GENTLEMEN: We take pleasure in testifying to the admirable fireproof qualities of your Asbestos Roofing.

At a fire which occurred at our works, May 26 last, our Roofing resisted the action of the flames after the woodwork on which it rested was almost or entirely destroyed.

We have found the roofing to be very durable where there is much walking upon it. Respectfully yours.

JORDAN IRON & CHEMICAL WORKS.

J. H. KOLB, Superintendent.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N.H.

List 28, describing 3,600 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C.Forsaith & Co.,Manchester,N.H.,and N.Y.city.

Cotton Belting, Rubber Belting, Leather Belting, Soapstone Packing, Empire Packing. Greene, Tweed & Co., New York.

Lehigh Valley Emery and Corundum Wheels are acknowledged to be the safest, freest cutting, and most durable wheels in use. Write for prices, stating sizes you use. L. V. E. W. Co., Lehighton, Pa.

American Fruit Drier. Free Pamphlet. See ad., p. 390.

72″ Independent 3 Jaw Chucks, $42; 48″, $36; 24″, $30. *Warranted* best in the world, and sent on trial. American Twist Drill Co., Meredith, N. H.

Ball's Variable Cut-off Engine. See adv., page 389.

Fire Brick. Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 389.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Paragon School Desk Extension Slides. See adv. p.389.

Brass & Copper in sheets, wire & blanks. See ad. p. 388.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p.388.

Draughtsman's Sensitive Paper. T.H.McCollin, Phila., Pa.

For Mill Mach'y & Mill Furnishing, see illus. adv. p.388.

Something new and interesting in Stemwinding Permutation Locks. See adv. of D. K. Miller Lock Co., p.389.

Sewing Machines and Gun Machinery in Variety. The Pratt & Whitney Co., Hartford, Conn.

Wanted.—Orders—Penfield Pulley Block Co., Lockport, N. Y.

Catechism of the Locomotive, 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N.Y.

Steam Pumps. See adv. Smith, Vaile & Co., p. 388.

Patent Key Seat Cutter. See page 388.

Wanted a Superintendent; a thoroughly capable man who understands the malleable iron business and is competent to manage the manufacturing department. State experience, reference, and salary expected. Address "Malleable," P. O. Box 332. Pittsburg, Pa.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Bostwick's Giant Riding Saw Machine, adv., page 372.

Small articles in sheet or cast brass made on contract. Send models for estimates to H. C. Goodrich, 66 to 72 Ogden Place, Chicago, Ill.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 373.

For Pat. Safety Elevators, Hoisting Engines. Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 372.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 374

4 to 40 H. P. Steam Engines. See adv. p. 372.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Cope & Maxwell M'f'g Co.'s Pump adv., page 353.

Supplee Steam Engine. See adv. p. 357.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 342.

Pure water furnished Cities, Paper Mills, Laundries, Steam Boilers, etc., by the Multiford System of the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Agents Wanted.—None but intelligent and energetic need apply. Must furnish good recommendations, or no notice will be taken of applications. Exclusive territory given. Agents are now making from $10 to $15 a day. Address, for terms, The Infallible Coin Scale Co., 267 Broadway, New York city.

Improved Skinner Portable Engines. Erie, Pa.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

NEW BOOKS AND PUBLICATIONS.

DIE ANNA-LISE. A German Play, by Hermann Hersch. With an interlinear translation and directions for learning to read German. By Prof. Charles F. Kroeh. New York: D. Appleton & Co.

The second part of Kroeh's German course. The plan of the course is eminently reasonable; and in carrying it out the author keeps always in mind the immediate requirements of the beginner. We have seen nothing better calculated to secure easy, rapid, and intelligent progress in learning to read German.

DIE ASPHALT-STRASSEN. Von E. Dietrich, Berlin, 1882. Commissions-Verlag von Julius Bohne. 8vo, 207 pp. $2.50.

Professor Dietrich's book describes very fully the crude materials, the manner of preparing the roadbed and footpath, the cleaning and repair of asphalt streets, with all the tools and machinery illustrated.

THE SILK WORM: BEING A BRIEF MANUAL OF INSTRUCTIONS FOR THE PRODUCTION OF SILK. By C. V. Riley, M.A., Ph.D., U. S. Entomologist. Washington: Government Printing Office.

In this second edition of Professor Riley's Silk Worm Report (Special Report No. 11, Department of Agriculture), the author says that every year's experience with osage orange as food for silk worms confirms all that he has said of its value. For eleven consecutive years he has obtained the best quality of silk from a race of worms fed on this plant (osage orange, *Maclura aurantiaca*). The tests made at the recent silk fair at Philadelphia showed that a larger yield of silk was obtained from worms fed on osage orange than from mulberry fed worms.

INSECTS INJURIOUS TO FOREST AND SHADE TREES. By A. S. Packard, Jr., M.D. 8vo, paper. pp. 275.

This Bulletin, No. 7 of the U. S. Entomological Commission, is intended to give a brief summary of the little that is known of the habits and appearance of insects injurious to American forest and shade trees. There is a vast amount of necessary work to be done in this department of entomology; and Mr. Packard's compilation seems to be well suited to interest tree owners and others in taking part in the work, at least so far as to report observations and send specimens to the entomologists of the department.

CONVERSATIONS ON THE PRINCIPAL SUBJECTS OF POLITICAL ECONOMY. By William Elder. Philadelphia: Henry Carey Baird & Co. 8vo, cloth. pp. 316. $2.50.

The author belongs to the American school of political economists whose views of the disputed questions of social and commercial affairs are more apt to be determined by the facts of history and the requirements of our national life than by the theories of closet philosophers or the interests of British trade. The discussions of International Trade and the beneficial influence of the protective development of home industries may be heartily commended to our legislators and voters.

COMPARATIVE NEW TESTAMENT. Philadelphia: Porter & Coates.

A good idea well carried out. The King James version of the New Testament and the new revision are arranged in parallel columns, the most convenient form possible for comparison and reference. The type is large and clear. The volume contains a history of the revision; the readings preferred by the American committee; notes, etc.

FIRST LESSONS IN GEOLOGY. By A. S. Packard, Jr. Providence, R. I.: Providence Lithograph Company. 8vo, paper. pp. 127.

Discusses in a popular way the action of water in earth sculpture and in moving materials; the geological action of heat; and sketches in a hasty manner the varying aspects of America during the several geological periods. It is intended to accompany the "Chautauqua Scientific Diagrams," to which it constantly refers. The illustrations should be in the book to make it generally useful.

RELATORIO DA ADMINISTRAÇÃO GERAL DAS MATAS relativo ao anno economico de 1879–1880. Lisboa. Imprensa nacional, 1881. pp. 298. 4vo.

In addition to numerous statistics and other valuable tables contained in this volume, we have a series of colored plates, 16 in number, in which are shown the isothermal lines and the geological formations of Portugal, as also the regions where different species of pines, oaks, and other trees abound.

BRIGHT FEATHERS; OR, SOME NORTH AMERICAN BIRDS OF BEAUTY. By Frank R. Rathbun. Auburn, N. Y.: Published by the Author. Parts II., III., and IV. Each $1.

The birds illustrated in these numbers of Bright Feathers are the rose-breasted grossbeak, the American goldfinch, and the summer warbler, giving in each instance male and female. Progressive improvement is shown in the coloring.

DIE ELECTRISCHE BELEUCHTUNG UND IHRE ANWENDUNG IN DER PRAXIS; von Dr. Alfred von Urbanitzky. Mit 85 Abbildungen. Wien, Pest, Leipzig. pp. 215. Small 8vo. Price $1.00. "THE ELECTRICAL ILLUMINATION AND ITS PRACTICAL USE."

This little book, which forms volume 95 of Hartleben's chemico-technical library, devotes but little space to the historical development of electric lighting, and after discussion of when and where electric illumination will pay proceeds at once to describe every known form of electrical machine; the Gramme, Buergin, Siemens, Brush, Weston, Wallace-Farmer, Guelcher, Schuckert, Edison, etc. The secondary battery is also described. All the forms of lamps are also described, and the methods of dividing the current. In the appendix the cost of electric lighting is given.

DER PRAKTISCHE EISEN- UND EISENWAARENKENNER. Kaufmännische-technische Eisenwaarenkunde, von Eduard Japing. Wien, Pest, Leipzig. pp. 568. Small 8vo. "THE PRACTICAL CONNOISSEUR OF IRON AND IRON WARE."

This forms volume 97 of the above series. It is intended as a hand book for dealers, importers, and consumers of iron ware. It is illustrated with 98 wood cuts. Price $1.50.

REVISTA GENERAL DE MARINA. Tomo X., Cuaderno 4°. Abril, 1882. Madrid, 1882.

The number and excellence of the scientific publications received from Spain show an encouraging advance in this direction.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) O. F. H. asks how to bend half inch iron pipes into a coil 12 inches in diameter. Would it have to be heated? How many square feet heating surface should a coil boiler have for an engine 2 inches by 2 inches, with 80 pounds steam, and 300 to 380 revolutions per minute? Would it run a boat 13 feet long, 2½ feet beam, 6 inches draught, with a 1 foot propeller, 5½ miles an hour? A. For your coil boiler you will have to heat the pipe, which should be extra strong, to a full red, and carefully draw it to the curve you require. You will scarcely be able to manage more than six to eight inches at once. Your engine, at your statement, figures three-fourths of one horse power. It would have to turn the propeller 12 inches in diameter, 300 revolutions per minute, to accomplish 5 miles per hour, allowing 50 per cent slip. We think you would fail in the speed, from the relative size of engine and propeller, and certainly in the coil boiler. Fifty feet of half inch pipe would be equivalent to three-fourths of a horse power; this will make 17 turns in your coil of 1 foot in diameter. You would have to inject the water as fast as it would be required. This looks well theoretically, but works badly in practice.

(2) A. E. B. asks: What can we use to make netting or seines waterproof? A. See "Waterproofing," page 83, vol. xlv.

(3) R. B. C. asks if a piece of hard steel is tempered to yellow, cooled, the surface brightened and drawn to the same color again, is the tool of the same temper as it was the first time it was drawn to yellow. I am told the steel is not any lower in temper if the operation is often repeated, and dispute the idea. A. Steel hardened and temper drawn to a straw color only will not be effective in hardness perceptibly, if it be polished and redrawn to a straw color only once. But if the operation is repeated several times, a change can be noticed. If the drawing be carried to the brown or deep straw color each time, the change in hardness will be still more perceptible.

(4) A. W. M. writes: I have a portable engine for thrashing purposes and farm use; but it stands idle for six or seven months in the year. 1. Is there anything to put in the boiler to prevent it from rusting? A. If you lay up your boiler in the early part of winter, when it would be liable to freeze, you may put into the boiler three or four quarts kerosene oil, after putting out all fire, and while the boiler is hot; then draw off all the water and as much of the oil as will run off, then close up the boiler tight so that no air can get in. Clean all the flues and put the boiler in a dry place in the barn or tool house, if it is a portable one. When you are ready to put it into use again, fill it full of water, get up steam, and blow out any oil that may be left in the boiler through the safety valve. Do this outside of any building. The handling of kerosene oil around a fire is dangerous at any time If you can prevent the boiler from freezing you can do nothing better than to close up tight and full of boiling water and let it stand until you need it again. It will not rust inside. You can take care of the outside by cleanliness, oiling, and shelter. Oil is really better outside of a boiler than upon the inside. 2. Would crude petroleum or common coal oil answer the purpose? Has hard or lime water any other bad effect on a boiler other than to scale it? A. Lime water does no harm to a boiler other than covering the flues and shell with scale.

(5) G. R. A. asks: 1. Is there any way to drill holes in plate glass? A. Can be done with a hard drill and spirits of turpentine—a tedious and uncertain process, and only for small holes. A diamond drill is much better and cheaper, if there are many holes to drill. If large holes are wanted, from a quarter inch to one inch or larger, prepare a piece of thin tubing of brass or copper, of the required size of hole, of 1 or 2 inches in length, with a small spindle and grooved pulley attached, something after the style of the watch maker's bow drill. Fasten upon the plate of glass, at the point to be drilled, a ring of metal or wood for a guide to keep the tubular drill in its place, until the cut is started sufficiently to steady the cutter. Lay the glass plate horizontally, and work the drill perpendicularly with the bow, using one hand to steady the upper end of the drill stock. Feed emery (about No. 90) and water into the open end of the tube as fast as required. In a very short time you will cut a disk out of the plate. 2. Where to get a book containing information of steam engines and machinery, giving rules for reckoning power and speed of same, also sizes of boilers, amount of heating surface and steam space required for same? A. Burgh's "Pocketbook of Practical Rules for the Proportions of Modern Engines and Boilers." 3. How is the speed of gearing reckoned? Do you take the mean diameter of each, *i. e.*, to center of teeth of each cog, and reckon same as pulleys? A. In planning gearing to work together, the diameters of the pitch lines are always considered; but in laying out the teeth, it is often found that the required number of teeth do not exactly match on a given pitch line. In this case, one or both of the assignments may be varied to make the teeth match. In laying out speeds for general machinery the computations are made by the relative number of teeth in the various wheels. Divide and multiply the same as you would the diameter of pulleys, using the number of teeth in place of the diameters of the pulleys.

(6) F. C. T. asks (1) what I can use as a flux while brazing cast iron? A. Cast iron can be brazed with brass by using borax rubbed upon a slate with water and a little caustic soda. Have the surfaces clean either by file scratching or grinding; rub the ground borax and soda well between the surfaces; tie the pieces closely with wire, and place the brass solder upon the top, so that it will not melt until the iron is hot enough to take it. A better solder can be made by melting ordinary brass with one-sixth of its weight of block tin, and pouring it slowly into water, which will separate it into granules that are very convenient for use. 2. Whether I should use common brass or brazing solder? I have tried borax, but it won't do. It all runs off the iron as soon as it becomes liquid, and acts like water thrown on a greasy surface, and the brass acts the same way as soon as it melts. It will not sweat into the joint at all, but run off to the fire. What is the matter? A. Silver solder or coin is still better, but expensive for large work. Heating the work quickly will melt the solder before the iron is hot enough to receive it, when the solder will roll off.

(7) M. J. S. asks: How can I make a thermostatic bar, so that I can regulate the heat in an incubator and maintain it at about 100°? A. Take a strip of sheet steel and a strip of sheet brass, about one inch wide and one-thirty-second of an inch thick, and from one to two feet long. Tin one side of each and bind the tinned sides together; heat and solder the pieces together with pure tin. Take off the wire binding, and screw one end fast inside of the incubator. This will be your thermostatic bar, having a considerable range, according to its length. The free end can be attached to a delicate shutter, which will operate as a ventilator; or to close and open the warm air passage, as you may find best upon trial. If you find the above combination not strong enough, you may make the pieces a little thicker, but the range will also be smaller. A glass rod or strip of plate glass and a bar of zinc about two feet long, with one end of each clamped together, the other ends fastened about one inch apart, have a great range, and have been used very successfully as a registering thermometer—their difference of expansion being greater than any two metals.

(8) E. E. M. writes: Considerable anxiety in this part about the "Wells comet." Would you please inform me through inquiry column of the SCIENTIFIC AMERICAN, when the above comet can be seen with the naked eye—where, and the exact time of night? A. The "Wells comet" does not show as well as expected. It has only been seen with the telescope, close to the horizon on the sun's track just after sunset. It may show up brighter after it passes its perihelion.

(9) A. S. asks: Can you recommend some apparatus or beer faucet to prevent beer becoming flat in the keg after tapping if not drawn off in a short time? A. Where such beverages cannot be drawn off within a few hours after tapping it is best to tap from barrels in the cellar by means of an air pressure pump and connecting tubes. There are several patented faucets in the market See our advertising columns and Hints to Correspondents.

(10) T. C. H. asks: Is all lead pipe manufactured by hydraulic pressure? A. As a rule it is. There may be cases in the country where the drawn head pipe cannot be obtained, that short pieces are made by hand.

(11) J. F. writes: 1. My friend says that the center of a shaft does not turn; I say it does. Which

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is right? A. Every physical part of any solid body turning upon an axis or center, moves; but the axis or center being an imaginary line only, is not supposed to turn. There is a quibble in the argument, which we think you will be able to divide with your friend. 2. How long does it take the planet Jupiter to make a revolution around the earth? A. The earth revolves to the same relative position in regard to Jupiter and the sun, in about 398 days. 3. How long does it take Venus to make a revolution around the earth? A. Venus does not revolve around the earth, but swings apparently like a pendulum across the heavens as it revolves around the sun in an orbit inside the earth's orbit. It becomes evening star, or comes to the same position in regard to the sun and earth, every 584½ days.

(12) L. N. S. asks how to keep steam boiler from corroding. I have seen in your paper a prescription for that purpose, but have forgotten what it was. The boiler is new, and I want to keep it clean. A. If you are using clear hard water, your boiler will become coated upon the inside with lime. Blow off daily, at least one cock. Clean out by washing and scraping once a month, or once in two months if there is but little incrustation. Put into the boiler a day before cleaning about one quart of tanner's liquor or a strong decoction of tan bark, oak, or hemlock per horse power. If this is not to be had then use one half pound caustic soda or potash to the horse power. Dissolve the soda or potash in water, and pump it into the boiler through the usual channel, as also for the tanners' liquor. The day's boiling will dissolve and crack off the scale, so that the boiler can be readily washed out. If you are using water that is considered soft, such as creek or river water, you may not need one-half the above quantity, or possibly nothing but thorough washing out every two or three months.

(13) C. W. P. asks: Will you inform me through the columns of your valuable paper, the SCIENTIFIC AMERICAN, wherein English steel comes into competition with American, and in what particular lines of manufacturing it does so most successfully? A. We do not think that English steel now holds a successful competition against American steel, especially in the grades that are much used. The vast increase in the American steel trade during the past few years, the ingenuity displayed in economizing machinery and labor to meet the increasing demand, have brought prices low enough to command the market. Our machinery, tool, and heavy spring steel is now fully equal in performance to the English, and ranges from 10 to 20 per cent less in price. The only kinds of foreign steel that have little or no competition here are the "Mushet steel," which is an alloy, and cannot be worked except in the forge and upon the grindstone; it is very tough, and is growing in favor for rough work; and the fine kinds of spring and Swiss steel, much used for clock and watch springs, gravers, and very small turning tools. More skill is required in the working, hardening, and tempering tools than falls to the lot of most machine shop blacksmiths. It is not advisable to put into the shop two or three brands of tool steel that requires to be often reworked and tempered. Take the advice of some large dealer in steel as to the kinds of steel sold for various uses; you can generally rely upon it.

(14) M. L. S. writes: I wish to devise a large cog wheel to be operated by a smaller wheel and a crank turned by hand. The large one to have attached to it a draw and rope, which will lift 1,000 pounds, from a depth of 500 feet. The machine to be worked by one or two man power. Please inform me what must be the circumference, weight, and number of cogs in large and small wheels. A. A man can exert upon a crank 15 inches long, or a swing of 30 inches, a lifting power of 30 pounds for ten hours with occasional rests. With the above crank, a pinion of 6 inches diameter at pitch line, working in a wheel of 6 feet diameter and winding drum of 1 foot diameter, a man will hoist 1,000 pounds from a depth of 500 feet in one hour and forty minutes. If you make a double crank for two men, you can make the drum larger so as to accomplish the task in one hour. Make 18 teeth in pinion; 216 teeth in the large wheel, 2 inches face for both. Cannot give the weight without making a detail drawing. You should decide as to the kind of rope you will use before you lay out the wheels. A hemp rope will have to be 1¼ inch or 1½ inch diameter for safety for such a load. The one foot drum would have to be 20 feet long to wind up 500 feet, unless you double up, which is injurious. If you can make the drum 3 feet diameter and 7 feet long, and put in a pair of intermediate gears to increase the power three times, you will have a more proportionate machine. The first pinion may be 4 inches, geared into a 12 inch wheel, and the 6 inch pinion into the 6 foot wheel. With this combination, the faces of the first and second should be 2 inches and the third and fourth should be 3 inches for safety. If you use wire rope, the drum should not be less than 4 feet diameter, wire rope five-eighths inch diameter, which would require the drum to be only 30 inches long. In this case you must increase the ratio of power in the gearing to suit the diameter of drum.

(15) R. L. M. asks: Can you inform me if there is any way of testing cutlery while purchasing without injury to the looks? If so, what is it? A. An examination of general appearance, in workmanship temper, character of edge, etc., are generally sufficient to enable a buyer to form a fair opinion of such goods. We know of no chemical or other special test applicable. 2. Also, can you give me a good receipt for silver plating? A. You will find good silver plating formulæ, etc., in SUPPLEMENT, No. 310.

(16) F. and T. ask: Would a steam launch, 16 feet in length, 4 feet 3 inches breadth of beam, and 2 feet deep, be a safe craft for two men to use in and about the inlets near Rockaway and Long Beach, and would she be able to make the trip from this city? What weight, including boiler and engine, would she carry? What power would be required to get the greatest speed practical in such a craft? Would we require a license to run her? A. We should consider the boat too small to be efficient with steam power. You would require a licensed engineer to run the boat, and probably the boat would have to be inspected and licensed.

(17) P. S. M. asks: Would the immersion of the lower end of a lightning rod in a leaching cesspool, which always contains more or less water, make a good ground connection? The cesspool receives the waste from the house, and, therefore, the water is somewhat greasy. Would such greasy nature interfere with conduction? A. The lower end of the rod should be attached to a metallic conducting surface that has an area of at least eighteen superficial feet in contact with water or moist earth. The mere insertion of the rod in the liquid, say for four feet, is, therefore, not a proper earth connection. Allowing the rod to be three-quarters of an inch square such insertion would only give an area of a little more than one superficial foot in contact with the liquid, instead of eighteen feet as required.

(18) A. W. says: I have been trying to draw water from a well with one inch gas pipe. It is 18 feet from elbow to the water, and the pipe rises 3 feet in the first 300 feet, and falls 36 feet in the next 700 feet. I filled the pipe from the highest point and then plugged it, and opened both ends at once, and it ran about twenty minutes and then stopped. I can draw water through it with a Douglass pump, but it will not flow. Is 15 foot fall too little to overcome the friction in 1,000 feet of pipe; or what is the matter? A. The friction in the long length of pipe is too great for the pressure, when it acts as a siphon. With the pump you have nearly double the pressure to force the water through the pipe. It may be there is an air leak in the pipe, which would soon stop the operation of a siphon.

(19) H. D. B. asks: Can you please tell me which is the fastest steamboat in the United States, where was it built, what line does it belong to, and how fast does it go? A. We know of no faster steamer than the Mary Powell, a fine passenger vessel now running daily on the Hudson River, between New York and Rondout. This boat, we believe, realizes an average of twenty-two miles an hour.

(20) H. and S. ask how the mould boards of plows are tempered so as to leave them in their proper shape, or rather to keep them from springing while tempering. A. Steel mould boards should be annealed before hardening, and receive their final fit, so that there should be no hammer-hardened surfaces or bending strains in the steel when it receives its heat for hardening. They must be dipped plumb, so that the water will touch both sides of the plate even, or at the same time, and not quickly, but rather slowly, with the point end down. If they spring, in spite of these precautions, you can heat the plates to about 300° Fah., and clamp them quickly to a former of the proper shape, and cool them with warm water. This will not draw the temper materially, and works well where accuracy is required. It is supposed, of course, that you use a low grade of steel, and do not draw temper. If you use oil instead of water for hardening, the same precautions apply.

(21) G. J. R. asks: Does steel get larger or smaller in hardening? A. It gets both larger and smaller; in fact, so erratic is its nature under various forms, and the variety of ways of heating and hardening, that nothing but a careful study and trial of the articles that you wish to harden will give you any exact knowledge of its tendencies. For instance, a ring die for punching boiler plates made of Krupp steel and fitted into its socket, say 2 inches or 2½ inches diameter, will not enter after hardening by about the one-hundredth of an inch. A 2 inch pipe die of English steel shrinks a little over one-hundredth of an inch upon the inside. As a general principle rings shrink and solids swell. Blocks cut from hammer-drawn flat steel are found to swell across the grain and shrink with the grain.

(22) A. M. S. asks: 1. What is the best method of quickly and thoroughly removing scale from steel forgings after annealing in wood or charcoal fire? A. Treat your forgings to a bath of hydrochloric (muriatic) acid and water, one part acid to eight or ten parts water, for from one to three or five hours, according to requirement of surface and strength of acid bath. If the work is small, a stone jar answers well. Use the mixture continuously, adding acid and water as may be required. If your work is large, you can swab the work over with a stronger acid, as is done with sulphuric acid upon cast iron. 2. Also of removing oil after "burning off" in tempering? A. For removing oil, dip the tempered work in a hot solution of caustic soda, then in boiling water, and dry quickly.

(23) H. H. B. asks: 1. What is the best thing I can use on rubber belting to prevent slipping? I have been in the habit of using castor oil and rosin, but I find that it causes the rubber coating on the pulley side of the belt to peel or strip off. My belts run where the temperature is high and full of hard coal gas. An ordinary leather belt will rot out in a very short time when run in this same hot room; but we bought a second-hand belt that was saturated with some sort of oil, so much so that it dripped from it for months; and it is in a good state of preservation to-day after four years' hard work. A. Use no oil of any kind upon rubber belting. Rub the belt with a piece of beeswax. It is the best for both leather and rubber belting. It does not require to be piled on; a little occasionally will make even a loose belt do large duty. 2. Is there any common oil that I can soak my lacings in to preserve them, as they rot out in about two months now? A. The only proper oil for lacings is that used by the tanners in dressing the leather, which is "neat's foot oil." Your lacings will keep well by wrapping in strong brown paper, and putting in a close drawer out of the influence of light and air. 3. What works can you recommend for the study of electricity, beginning at the first principles? A. "Ganot's Physics," "Prescott's Electricity and the Electric Telegraph," "Gordon's Electricity," also back number of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

E A. W.—It is a variety of chalcedony. If found in any considerable quantity and in large clear pieces it can be used for making articles of ornament, such as clocks, vases, etc.

COMMUNICATIONS RECEIVED.

On the Liver Fluke. By R. W. S.
On the Explosion of a Sawmill Boiler. By H. J. B.
On Thunderbolts. By E. F. D.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

May 30, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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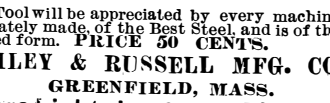

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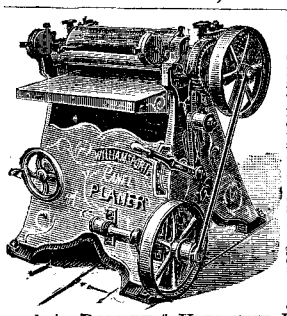
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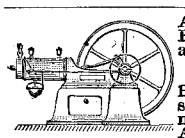
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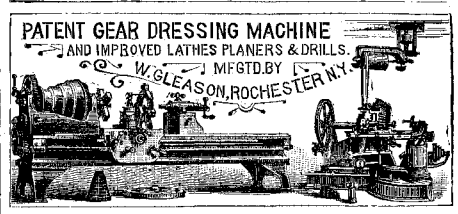
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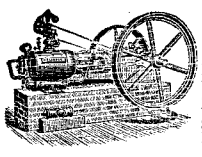
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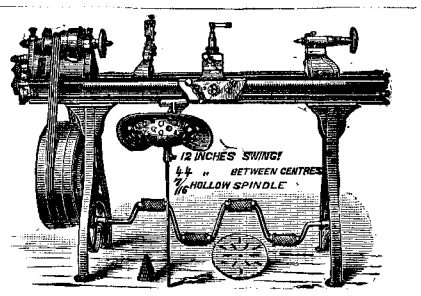

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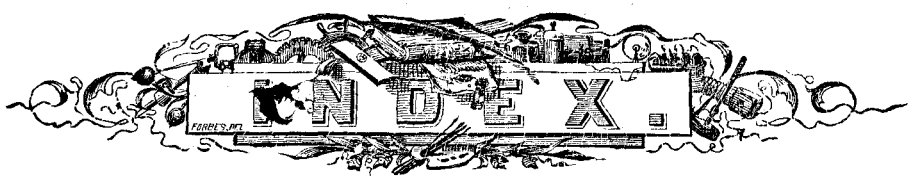

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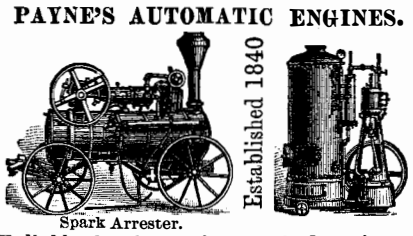

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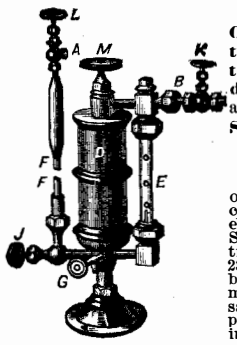

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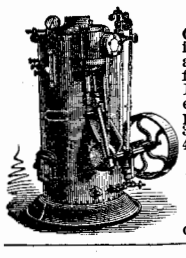

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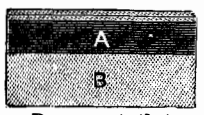

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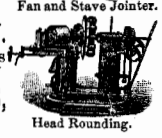
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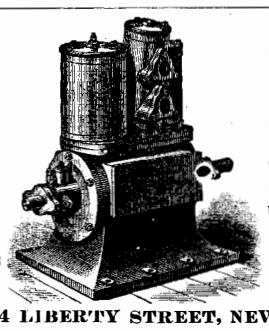

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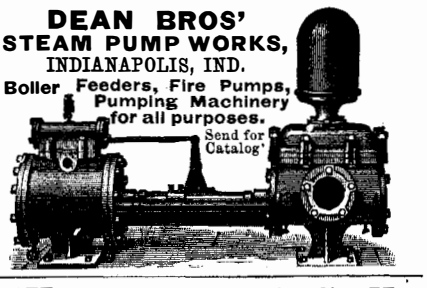

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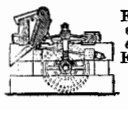

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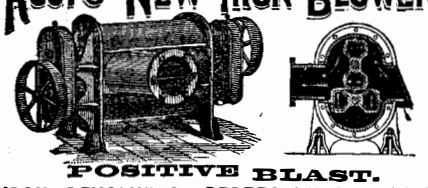

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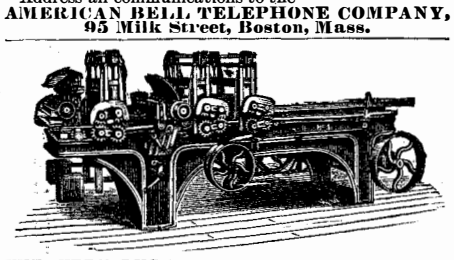

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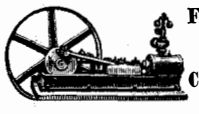

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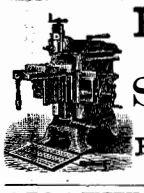

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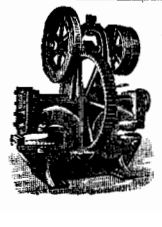

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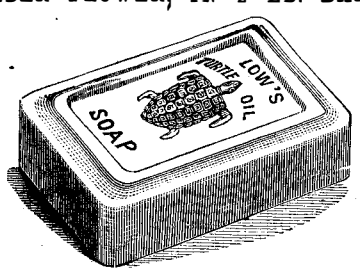

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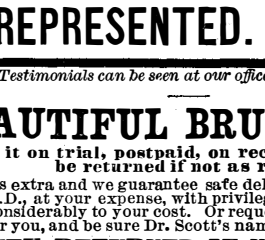

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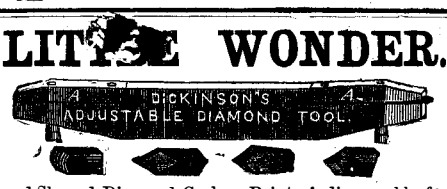

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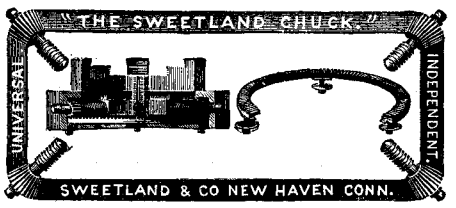

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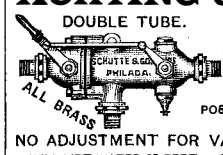

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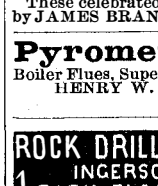

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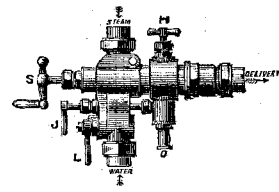

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